US011693507B2

(12) United States Patent
Lee et al.

(10) Patent No.: US 11,693,507 B2
(45) Date of Patent: Jul. 4, 2023

(54) **ORGANIC LIGHT EMITTING DISPLAY WITH TOUCH SENSOR**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **17/890,732**

(22) Filed: **Aug. 18, 2022**

(65) **Prior Publication Data**

US 2022/0404941 A1 Dec. 22, 2022

Related U.S. Application Data

(63) Continuation of application No. 17/504,415, filed on Oct. 18, 2021, now Pat. No. 11,455,058, which is a (Continued)

(30) **Foreign Application Priority Data**

Sep. 30, 2016 (KR) 10-2016-0126723

(51) **Int. Cl.**
G06F 3/041 (2006.01)
G06F 3/044 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***G06F 3/04164*** (2019.05); ***G06F 3/0412*** (2013.01); ***G06F 3/0443*** (2019.05);
(Continued)

(58) **Field of Classification Search**
CPC G06F 3/04164
See application file for complete search history.

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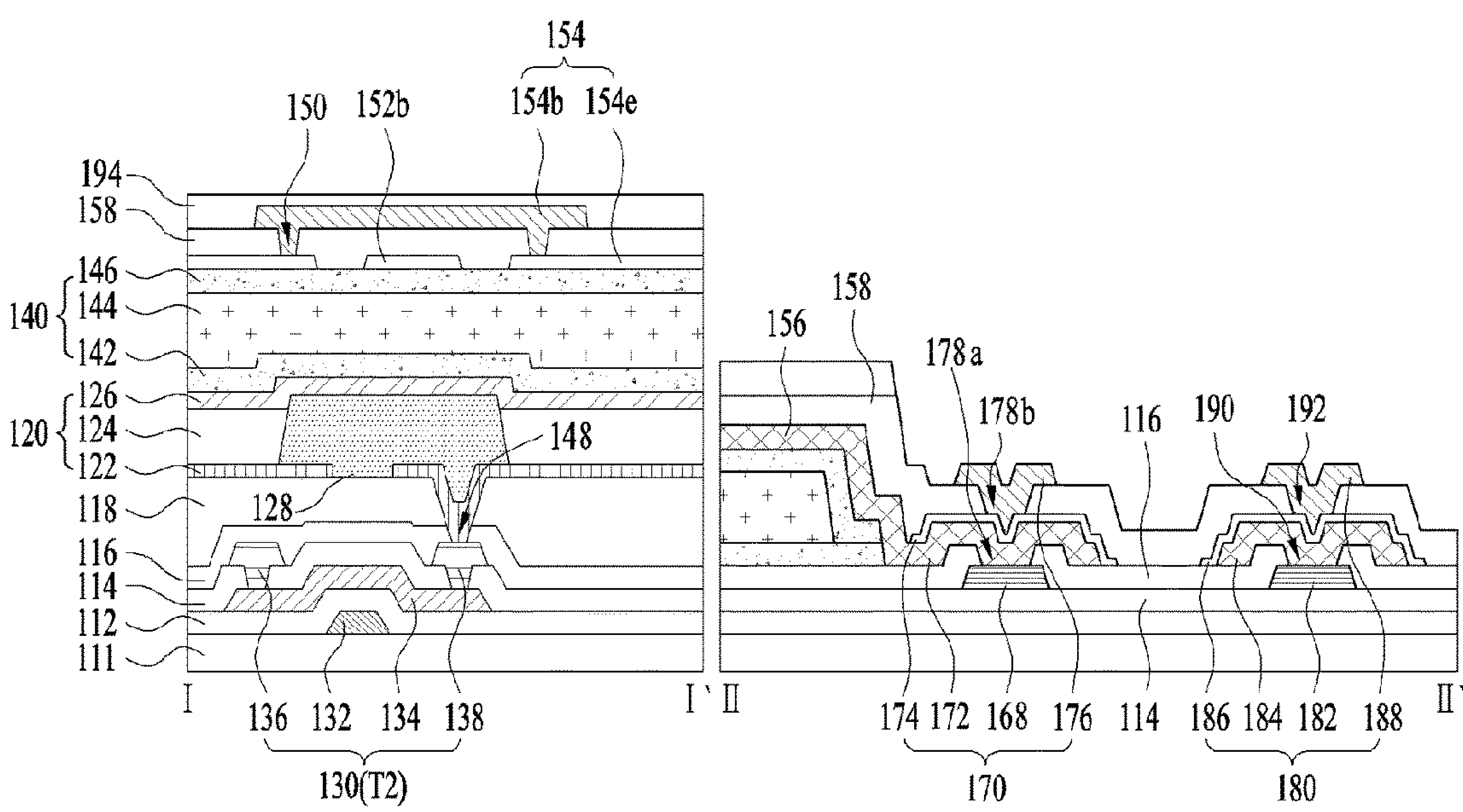
(74) *Attorney, Agent, or Firm* — Fenwick & West LLP

(57) **ABSTRACT**

Disclosed is an organic light emitting display device with a touch sensor. The display device has a touch sensor that is directly disposed on a sealing part, thus removing the necessity of an additional adhesion process, simplifying a manufacturing process and reducing manufacture cost. In addition, the display device with the touch sensor includes a display cover electrode of a display pad that is made of a same material as a conductive layer included in the touch sensor, thus preventing damage to the display pad electrode.

22 Claims, 17 Drawing Sheets



Related U.S. Application Data

continuation of application No. 16/733,897, filed on Jan. 3, 2020, now Pat. No. 11,182,015, which is a continuation of application No. 15/436,393, filed on Feb. 17, 2017, now Pat. No. 10,572,057.

(51) **Int. Cl.**

H10K 50/805	(2023.01)
H10K 50/814	(2023.01)
H10K 50/824	(2023.01)
H10K 50/844	(2023.01)
H10K 59/38	(2023.01)
H10K 59/40	(2023.01)
H10K 59/123	(2023.01)
H10K 59/35	(2023.01)
H10K 59/121	(2023.01)
H10K 71/00	(2023.01)
H10K 59/131	(2023.01)
H10K 59/12	(2023.01)

(52) **U.S. Cl.**

CPC ***G06F 3/0446*** (2019.05); ***H10K 50/805*** (2023.02); ***H10K 50/814*** (2023.02); ***H10K 50/824*** (2023.02); ***H10K 50/844*** (2023.02); ***H10K 59/123*** (2023.02); ***H10K 59/1213*** (2023.02); ***H10K 59/351*** (2023.02); ***H10K 59/38*** (2023.02); ***H10K 59/40*** (2023.02); ***H10K 71/00*** (2023.02); *G06F 2203/04103* (2013.01); *G06F 2203/04111* (2013.01); *G06F 2203/04112* (2013.01); *H10K 59/1201* (2023.02); *H10K 59/131* (2023.02)

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FIG. 1

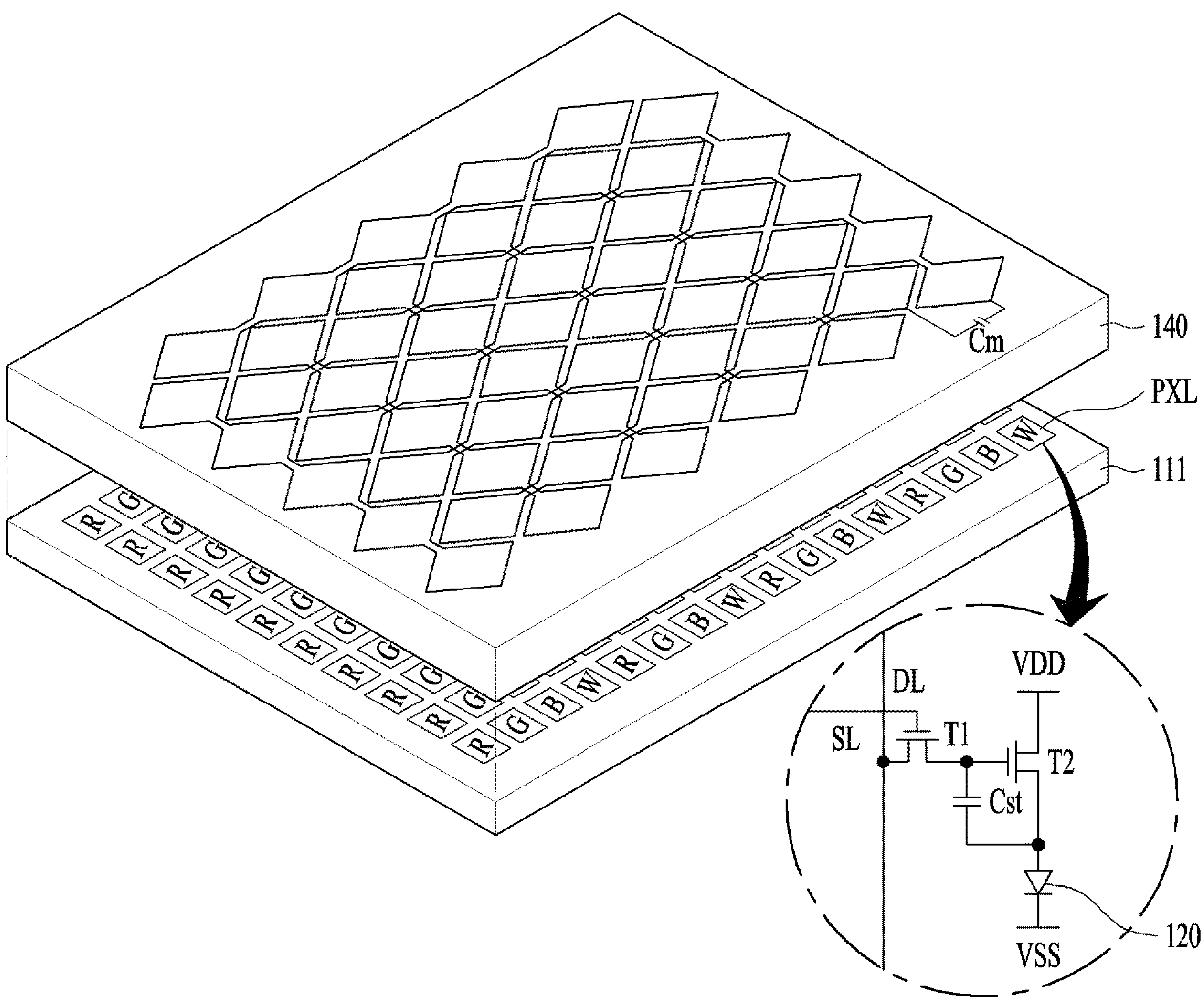


FIG. 2

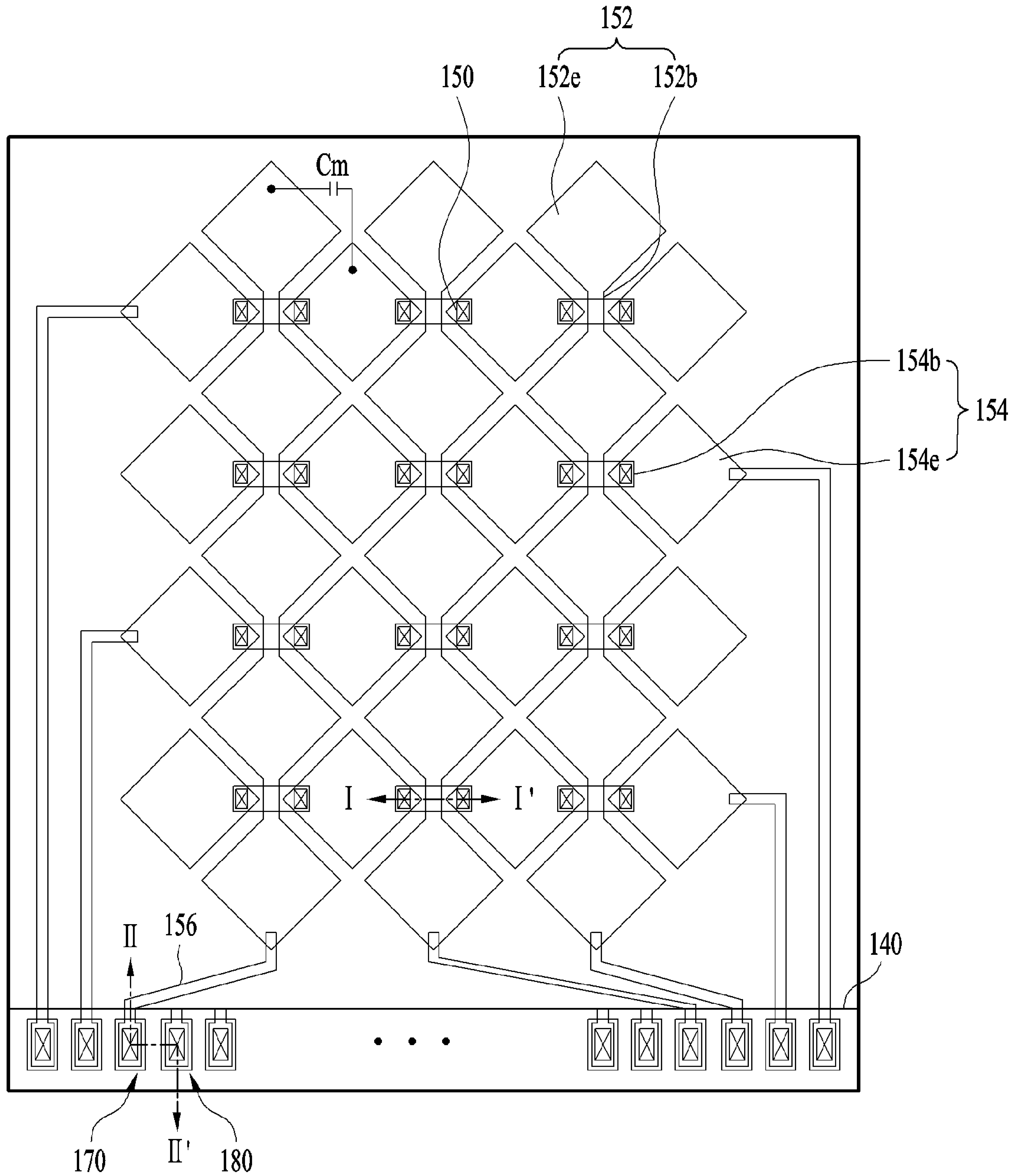
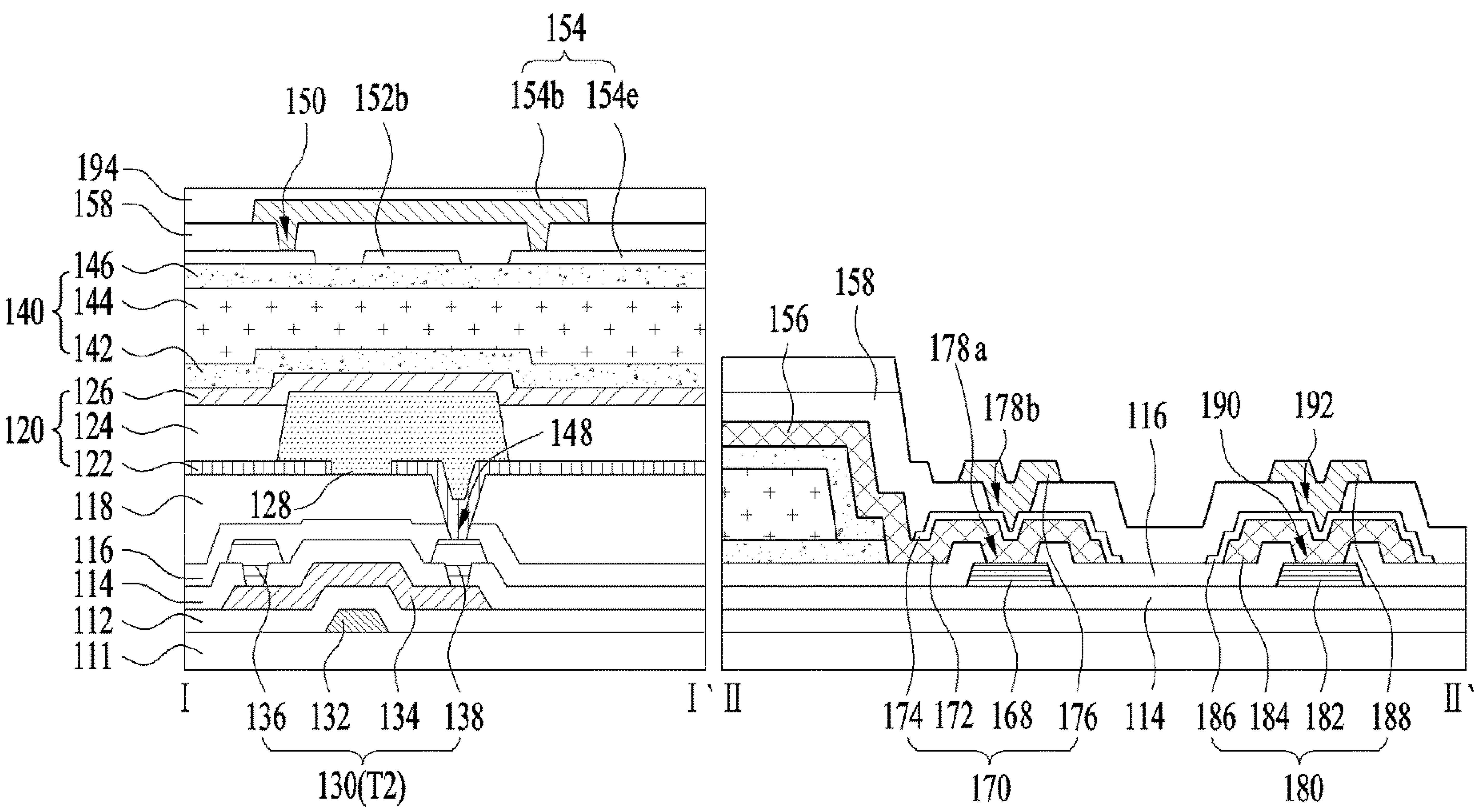


FIG. 3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154e
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120
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122
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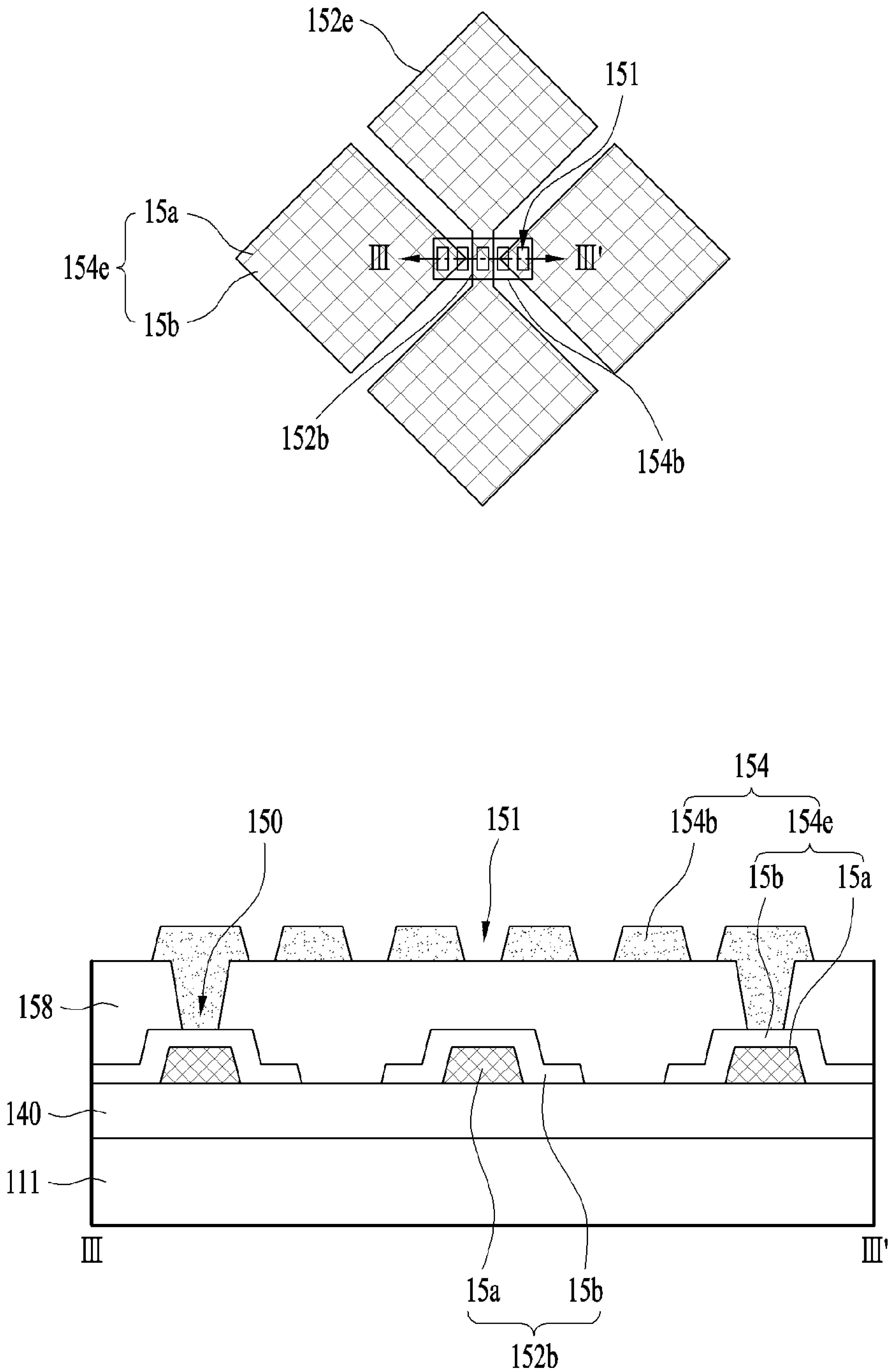
128
116
114
112
111
I
136
132
134
138
I`
130(T2)
158
156
178a
178b
116
190
192
II
174
172
168
176
114
186
184
182
188
II`
170
180

FIG. 4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Ⅲ
Ⅲ'
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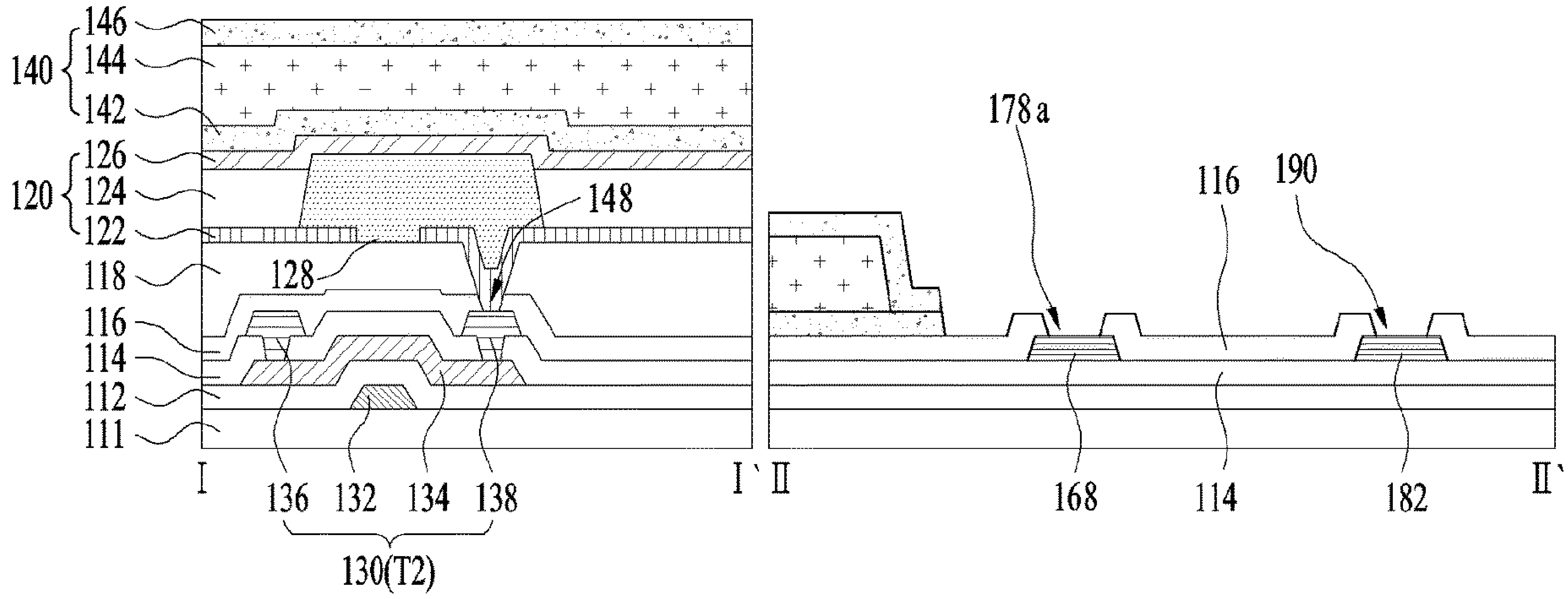
15b
152b

FIG. 5A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I`
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178a
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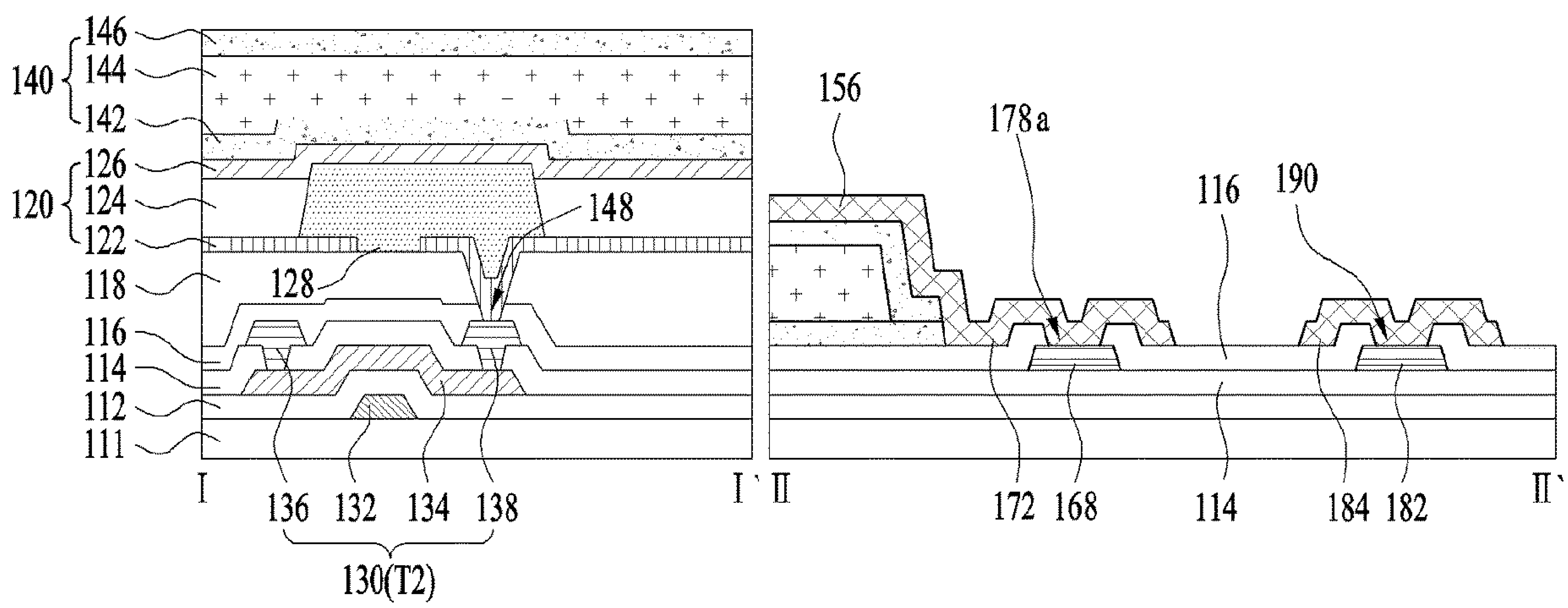
190
168
114
182
II`

FIG. 5B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178a
116
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168
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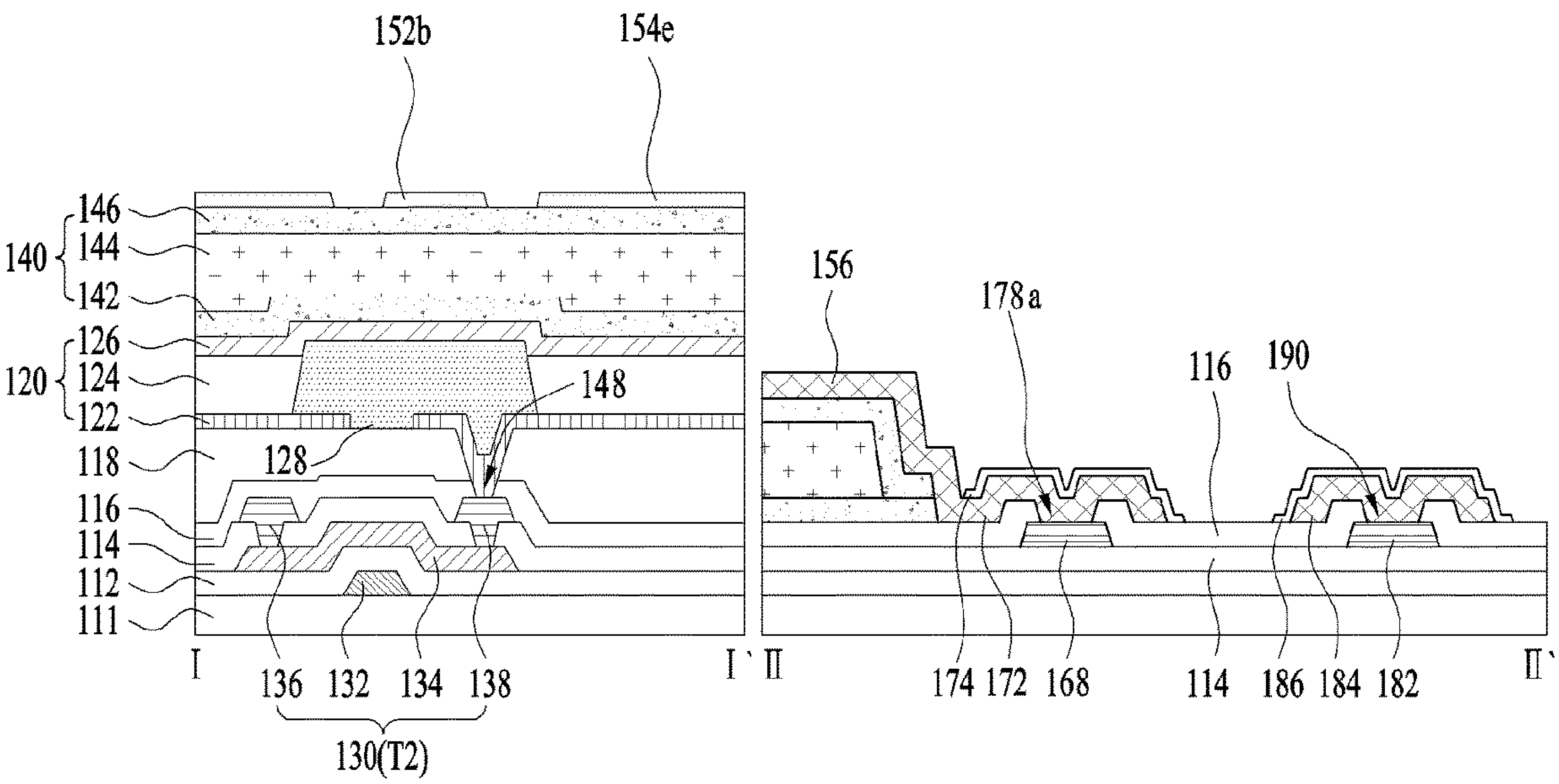
184
182
II`

FIG. 5C



152b
154e
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I`
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178a
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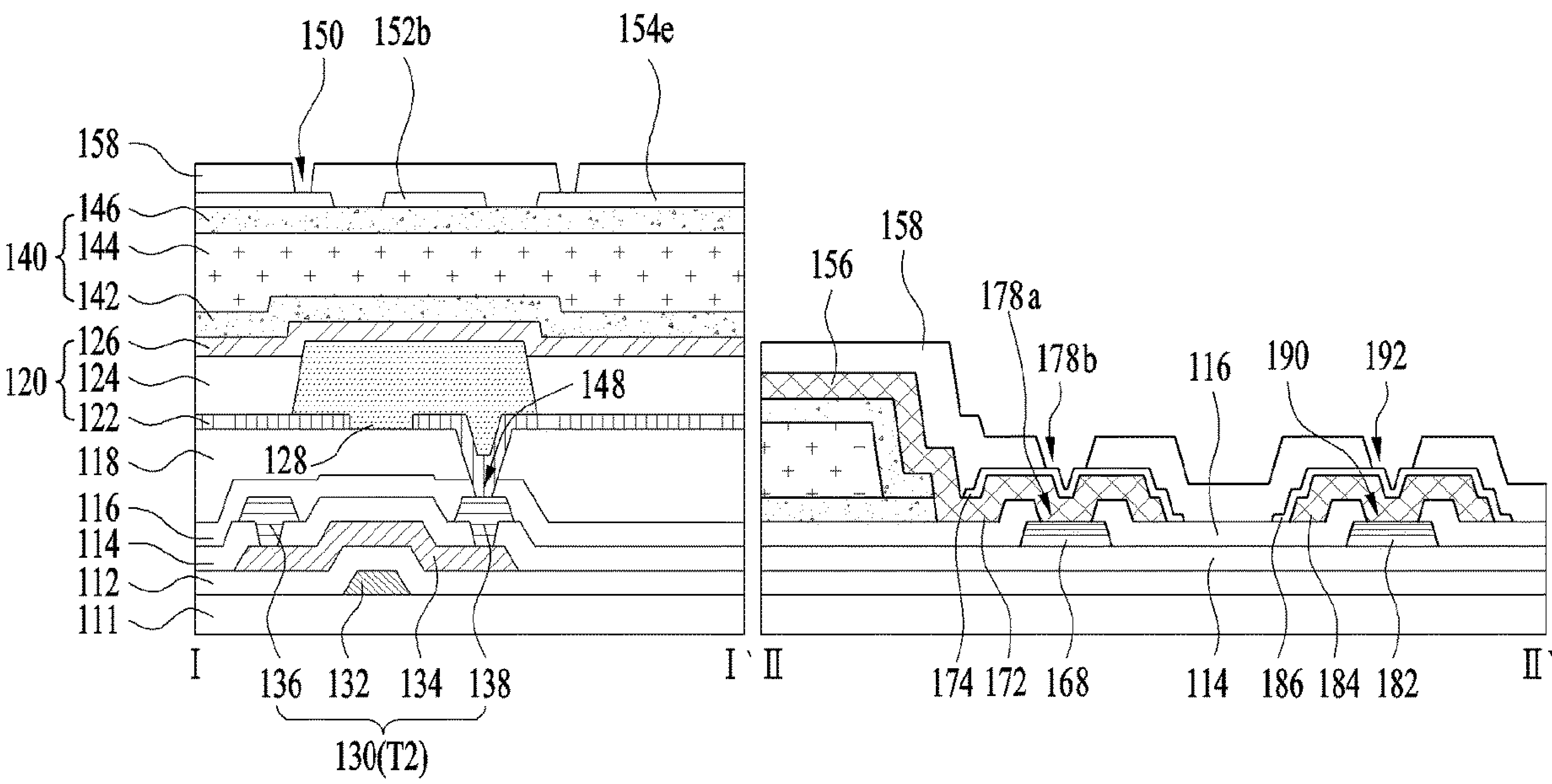
II`

FIG. 5D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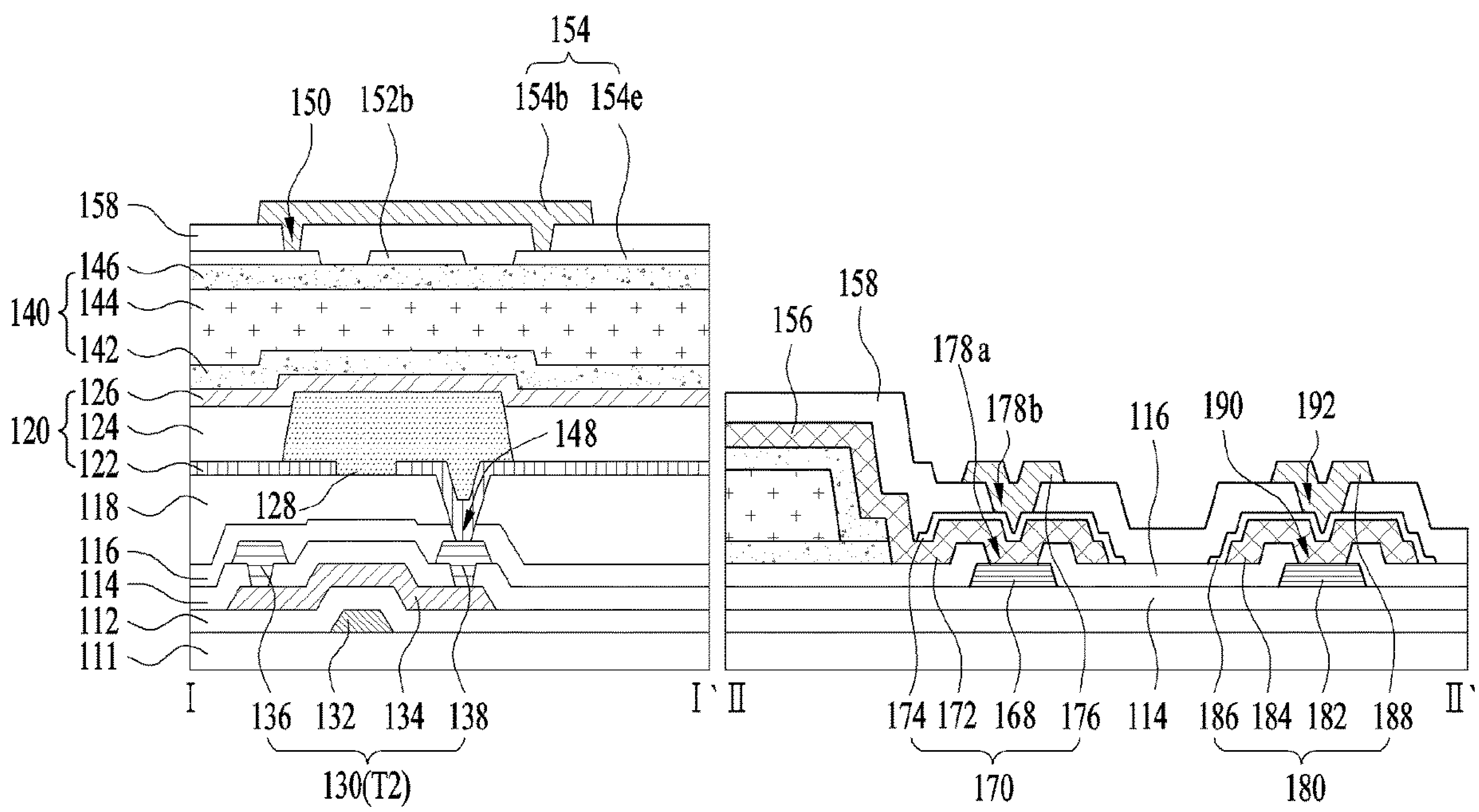
II`

FIG. 5E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II`
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FIG. 6

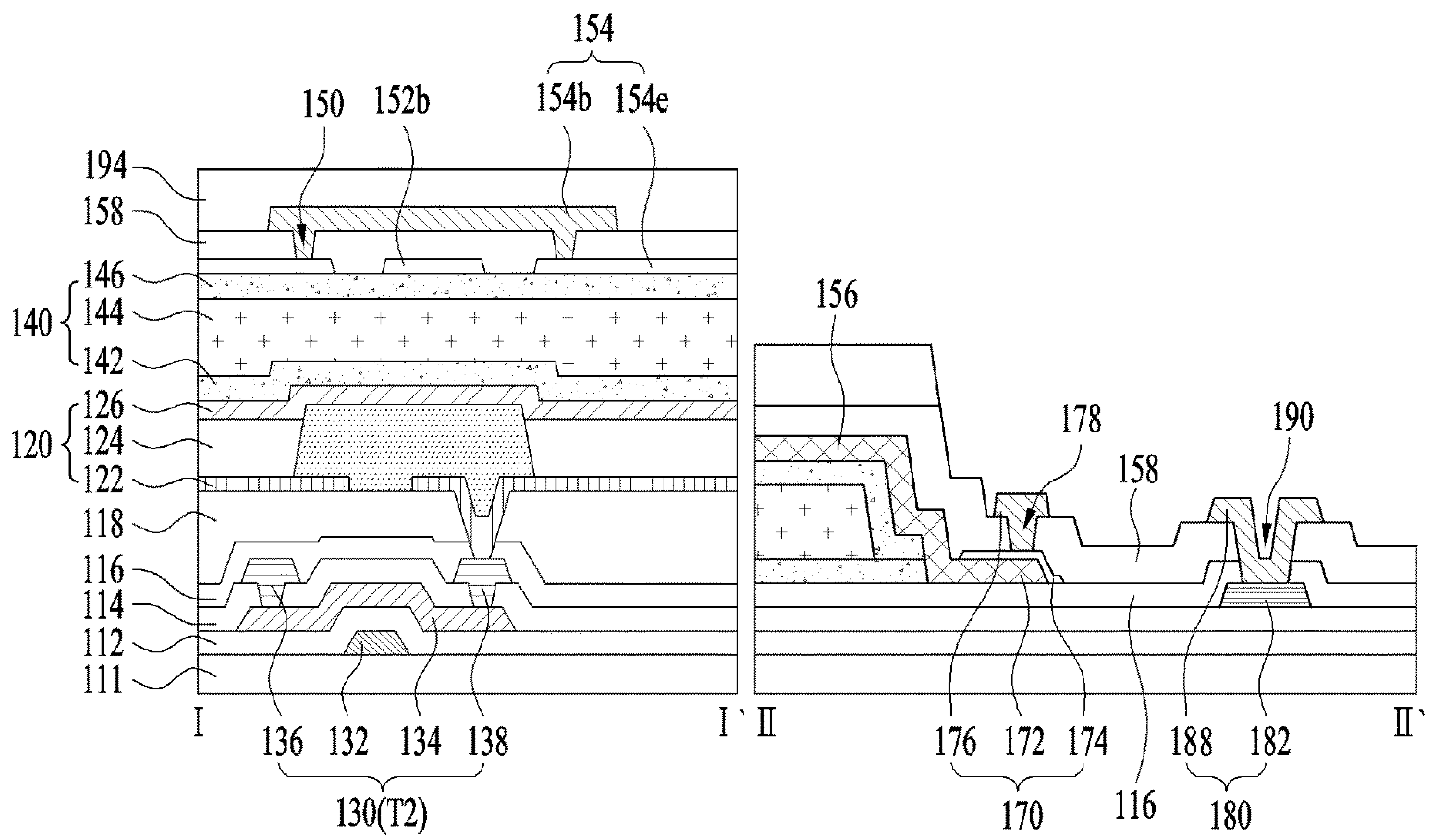
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FIG. 7A

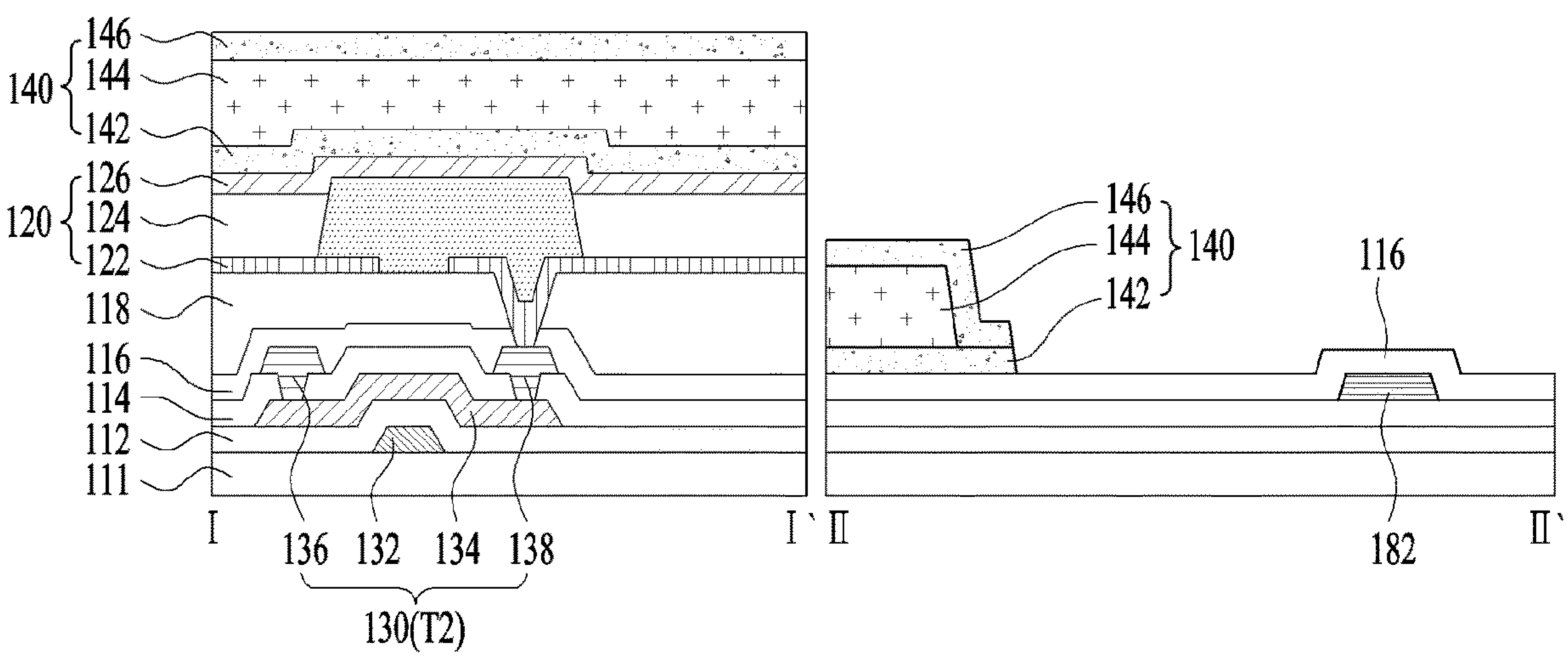
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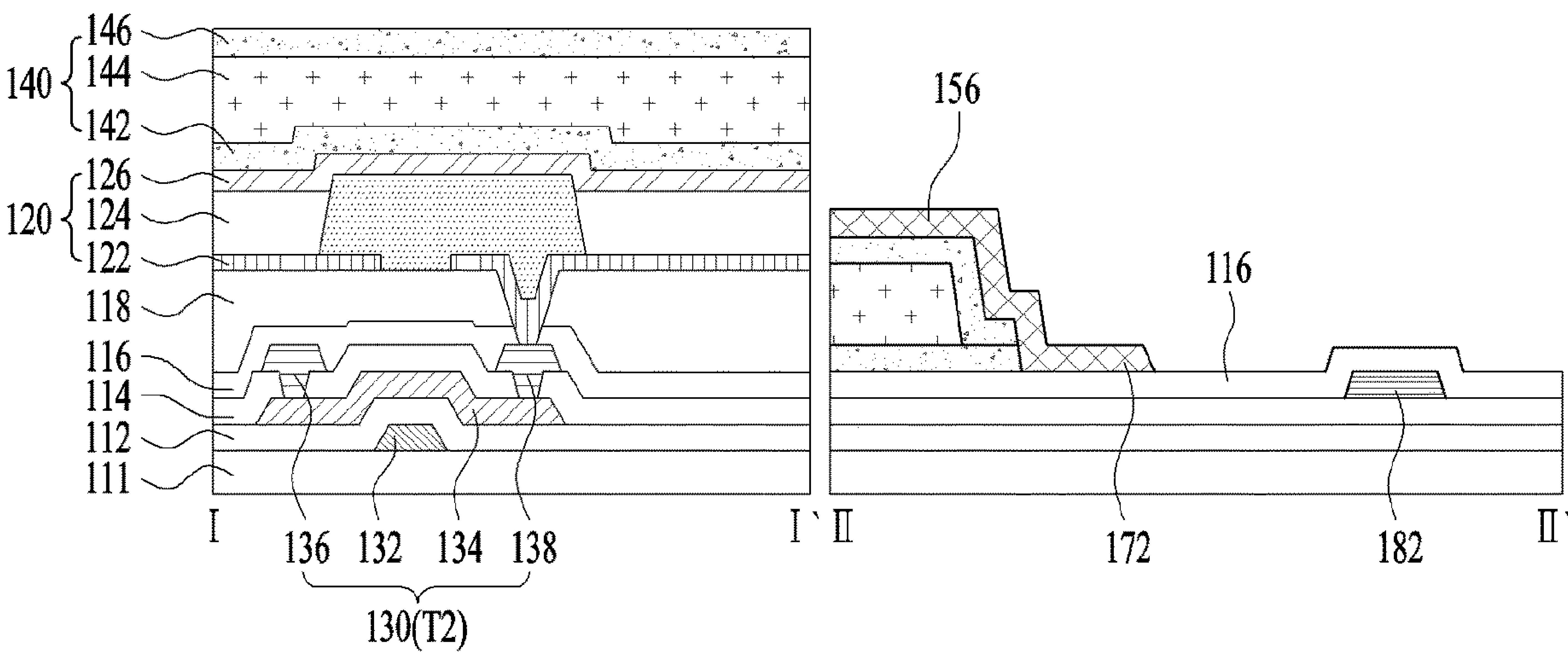
FIG. 7B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130(T2)
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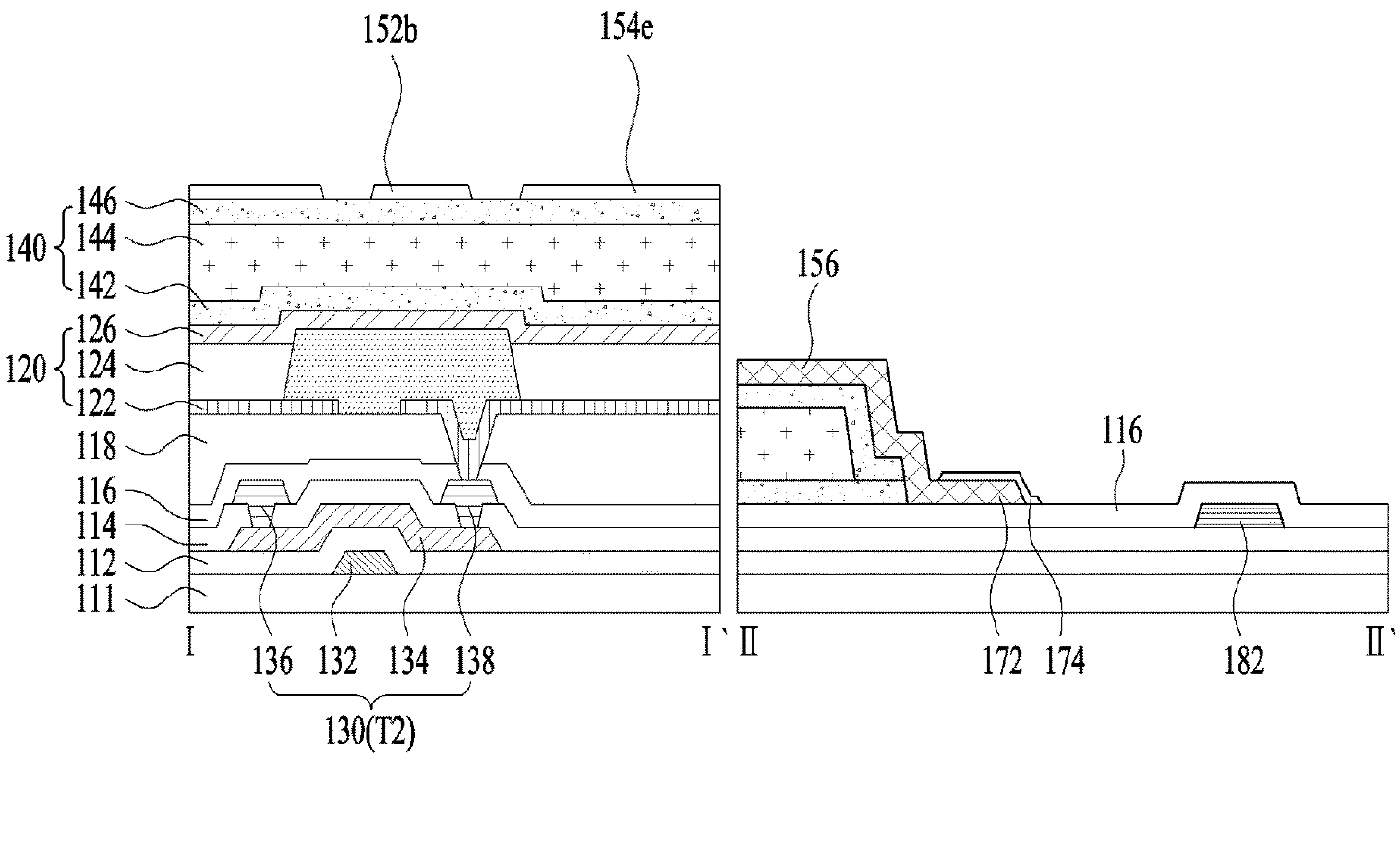
172
182
II`

FIG. 7C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I`
130(T2)
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II
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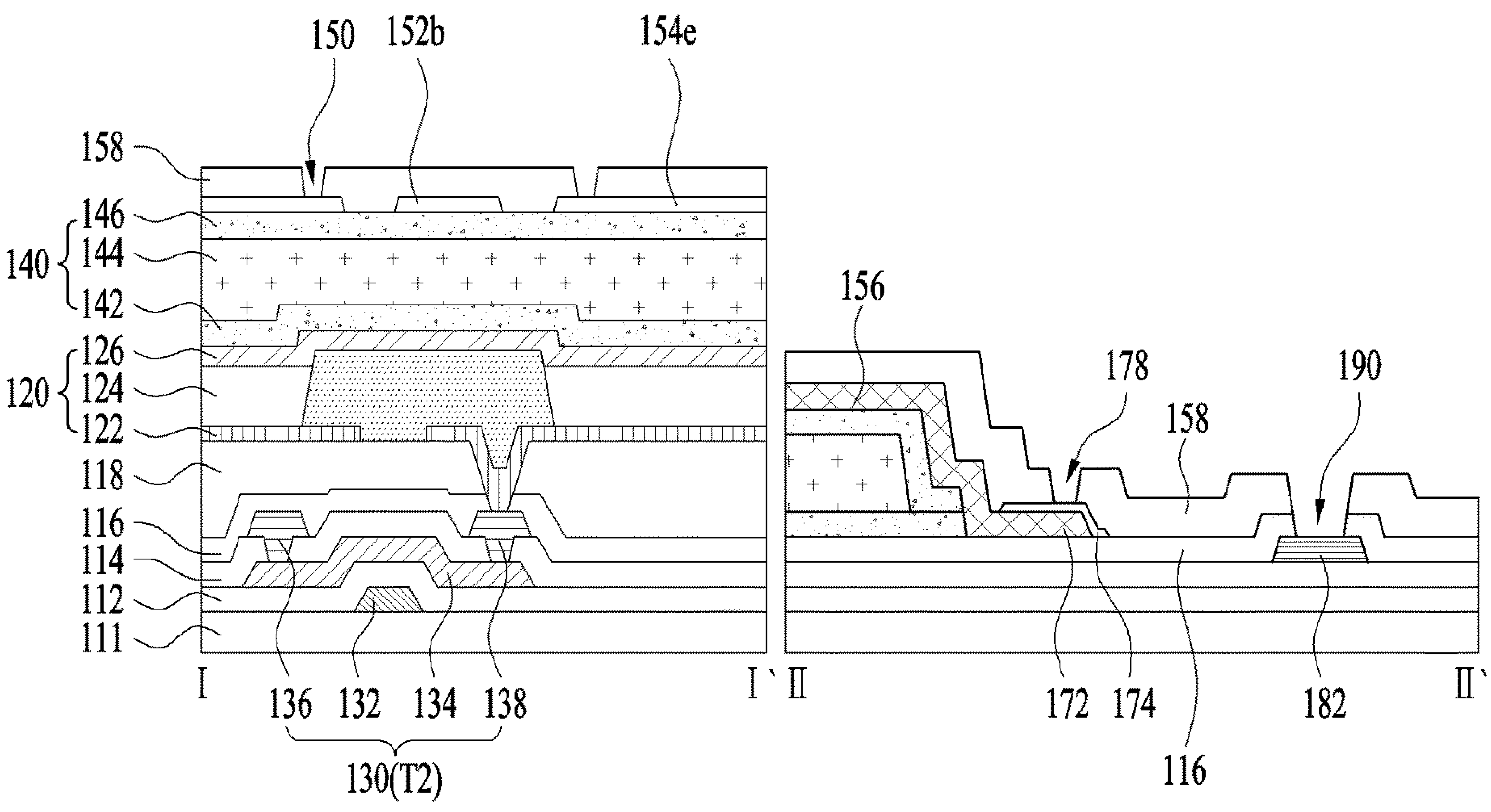
174
182
II`

FIG. 7D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130(T2)
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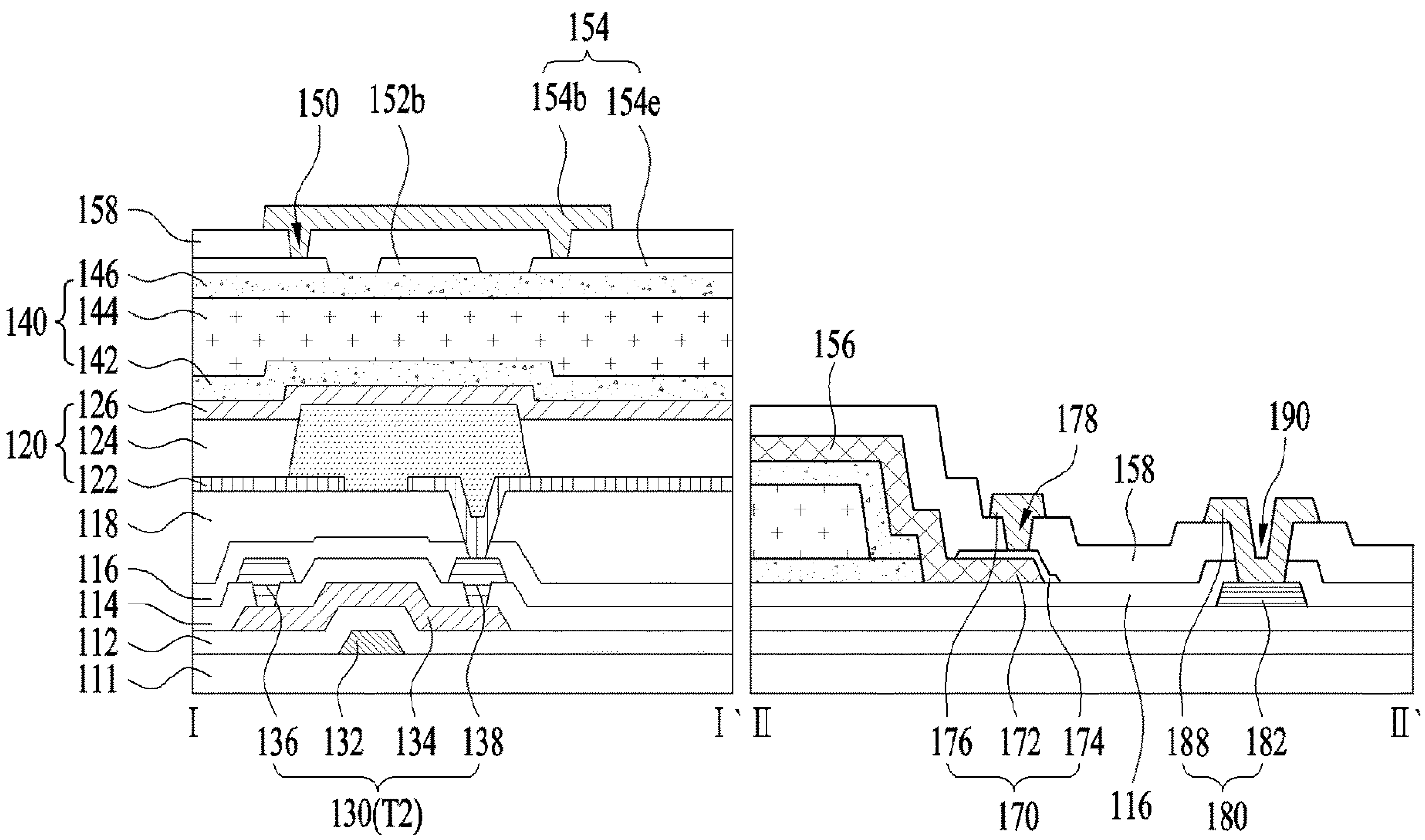
II`
116

FIG. 7E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130(T2)
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II`

FIG. 8a

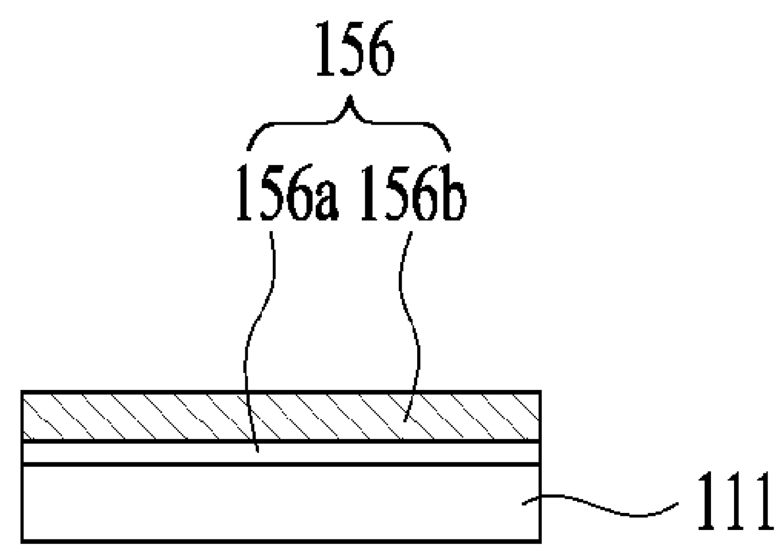


FIG. 8b

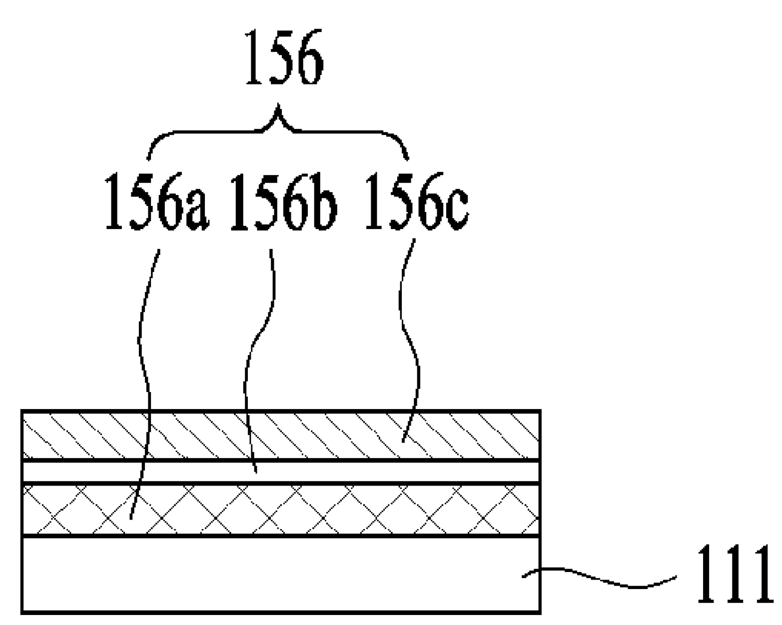
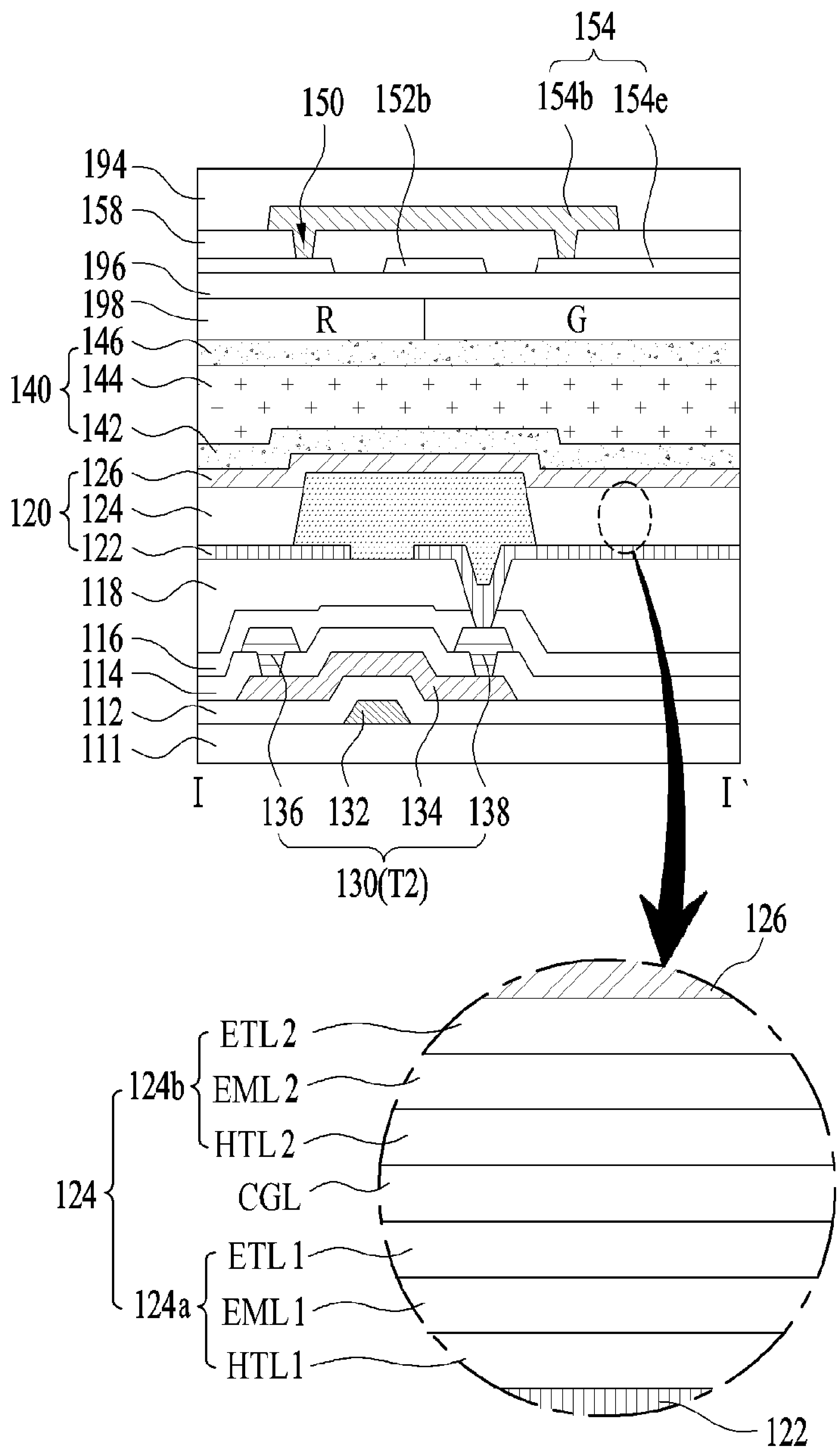


FIG. 9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114
112
111
I
I`
136
132
134
138
130(T2)
126
ETL 2
EML 2
124b
HTL 2
124
CGL
ETL 1
124a
EML 1
HTL 1
122

ORGANIC LIGHT EMITTING DISPLAY WITH TOUCH SENSOR

CROSS-REFERENCE TO RELATED APPLICATIONS

This application is a continuation of U.S. patent application Ser. No. 17/504,415 filed on Oct. 18, 2021 which is a continuation of U.S. patent application Ser. No. 16/733,897 filed on Jan. 3, 2020 which is a continuation of U.S. patent application Ser. No. 15/436,393 filed on Feb. 17, 2017 which claims the benefit of Korean Patent Application No. 10-2016-0126723, filed on Sep. 30, 2016, each of which is hereby incorporated by reference in its entirety.

BACKGROUND

Field of Technology

The present disclosure relates to an organic light emitting display with a touch sensor and a method of manufacturing the same, and more particularly, to an organic light emitting display with a touch sensor and a method of manufacturing the same to simplify a manufacturing process and reduce manufacturing costs.

Discussion of the Related Art

A touchscreen is a device for inputting a user's command by selecting an instruction shown on a screen of a display or the like with the hand of the user or an object. That is, the touchscreen converts a contact position thereof that directly contacts the hand of the user or the object into an electrical signal and receives the instruction selected in the contact position as an input signal. Such a touchscreen can replace an additional input device such as a keyboard or mouse which is operated in connection with a display and application thereof is thus gradually expanding.

In general, such a touchscreen is often attached to the front surface of a display panel such as a liquid crystal display panel or an organic electroluminescent display panel through an adhesive agent. In this case, there are problems of a complicated overall process and increased costs resulting from an additional attachment process, because the touchscreen is separately produced and is attached to the front surface of the display panel.

SUMMARY

Accordingly, the present disclosure is directed to a an organic light emitting display with a touch sensor and a method of manufacturing the same that substantially obviate one or more problems due to limitations and disadvantages of the related art.

An object of the present disclosure is to provide an organic light emitting display with a touch sensor and a method of manufacturing the same to simplify a manufacturing process and reduce manufacturing costs.

Additional advantages, objects, and features of the invention will be set forth in part in the description which follows and in part will become apparent to those having ordinary skill in the art upon examination of the following or may be learned from practice of the invention. The objectives and other advantages of the invention may be realized and attained by the structure particularly pointed out in the written description and claims hereof as well as the appended drawings.

To achieve these objects and other advantages and in accordance with the purpose of the invention, as embodied and broadly described herein, an organic light emitting display with a touch sensor according to the present invention has a structure in which a touch sensor is directly disposed on a encapsulation part, thus removing the necessity of an additional adhesion process, simplifying a manufacturing process and reducing manufacturing costs. In addition, the organic light emitting display with a touch sensor has a structure in which a display cover electrode of a display pad is disposed on the same plane as a conductive layer included in the touch sensor using the same material as the conductive layer, thus preventing damage to the display pad electrode.

In one embodiment, a display device comprises: a thin film transistor disposed in an active region of a substrate that displays images; a display pad disposed in a non-active region of the substrate that does not display images; a light emitting device connected to the thin film transistor; an encapsulation layer on the light emitting device; a touch sensor on the encapsulation layer in the active region of the substrate, the touch sensor including a conductive layer; and a touch pad in the non-active region of the substrate and the touch pad connected to the touch sensor, wherein the display pad includes a display pad electrode and a display cover electrode over the display pad electrode, the display pad electrode connected to a signal line in the active region and the display cover electrode covering a portion of the display pad electrode and made of a same material as the conductive layer.

It is to be understood that both the foregoing general description and the following detailed description of the present invention are exemplary and explanatory and are intended to provide further explanation of the invention as claimed.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are included to provide a further understanding of the invention and are incorporated in and constitute a part of this application, illustrate embodiment(s) of the invention and together with the description serve to explain the principle of the invention. In the drawings:

FIG. **1** is a perspective view illustrating an organic light emitting display with a touch sensor according to a first embodiment of the present disclosure;

FIG. **2** is a plan view illustrating the organic light emitting display with a touch sensor shown in FIG. **1** according to the first embodiment of the present disclosure;

FIG. **3** is a sectional view illustrating the organic light emitting display with a touch sensor taken along the lines "I-I'", and "II-II'" of FIG. **2** according to the first embodiment of the present disclosure;

FIG. **4** is a plan view and a sectional view illustrating another embodiment of the touch electrode shown in FIGS. **2** and **3**;

FIGS. **5**A to **5**E are sectional views illustrating a method of manufacturing the organic light emitting display with a touch sensor according to the first embodiment of the present disclosure;

FIG. **6** is a sectional view illustrating the organic light emitting display with a touch sensor according to a second embodiment of the present disclosure;

FIGS. 7A to 7E are sectional views illustrating a method of manufacturing the organic light emitting display with a touch sensor according to the second embodiment of the present disclosure;

FIGS. 8A and 8B are sectional views illustrating other embodiments of the routing line shown in FIG. 6; and

FIG. 9 is a sectional view illustrating an organic light emitting display with a touch sensor according to a third embodiment of the present disclosure.

DETAILED DESCRIPTION

Reference will now be made in detail to different embodiments of the present disclosure, examples of which are illustrated in the accompanying drawings. Wherever possible, the same reference numbers will be used throughout the drawings to refer to the same or like parts.

Hereinafter, embodiments of the present disclosure will be described with reference to the annexed drawings in detail.

FIGS. **1** and **2** are a perspective view and a plan view illustrating an organic light emitting display with a touch sensor according to the present disclosure, respectively.

The organic light emitting display with a touch sensor illustrated in FIGS. **1** and **2** detects variation in mutual capacitance (Cm) by touch of a user through touch electrodes **152***e* and **154***e* during a touch period to sense the presence of touch and touch position. In addition, the organic light emitting display with a touch sensor displays an image through a unit pixel including a light emitting device **120** during a display period. The unit pixel includes red (R), green (G) and blue (B) sub-pixels (PXL), or red (R), green (G), blue (B) and white (W) sub-pixels (PXL).

For this purpose, the organic light emitting display shown in FIG. **1** includes a plurality of sub-pixels (PXL) disposed in the form of a matrix on a substrate **111**, a encapsulation part **140** disposed on the sub-pixels (PXL), and a mutual capacitance (Cm) disposed on the encapsulation part **140**.

Each of the sub-pixels (PXL) includes a pixel driving circuit and a light emitting device **120** connected to the pixel driving circuit.

The pixel driving circuit includes a switching transistor (T**1**), a driving transistor (T**2**) and a storage capacitor (Cst).

The switching transistor (T**1**) is turned on when a scan pulse is supplied to a scan line (SL) and supplies a data signal supplied to a data line (DL) to the storage capacitor (Cst) and a gate electrode of the driving transistor (T**2**).

In response to the data signal supplied to the gate electrode of the driving transistor (T**2**), the driving transistor (T**2**) controls a current (I) supplied from a high-voltage power (VDD) line to the light emitting device **120**, thereby regulating the amount of light emitted by the light emitting device **120**. In addition, although the switching transistor (T**1**) is turned off, the driving transistor (T**2**) supplies a predetermined current (I) by the voltage charged in the storage capacitor (Cst) until a data signal of the next frame is supplied, thereby maintaining light emission of the light emitting device **120**.

As illustrated in FIG. **3**, the driving thin film transistors (T**2**) **130** includes a gate electrode **132**, a semiconductor layer **134** overlapping the gate electrode **132** via a gate insulating layer **112**, and source electrode **136** and drain electrode **138** formed on an interlayer insulating layer **114** and contacting the semiconductor layer **134**.

The light emitting device **120** is disposed in an active region of the substrate **111** and includes an anode **122**, a light emitting stack **124** formed on the anode **122**, and a cathode **126** formed on the light emitting stack **124**.

The anode **122** is electrically connected to a drain electrode **138** of the driving thin film transistor **130** exposed through a pixel contact hole **148** passing through a planarization layer **118**. The light emitting stack **124** is formed on the anode **122** of a light emission region provided by a bank **128**. The light emitting stack **124** is formed by stacking a hole-related layer, an organic light emitting layer and an electron-related layer in order or reverse order on the anode **122**. The cathode **126** faces the anode **122** via the light emitting stack **124**.

The encapsulation part **140** blocks permeation of exterior moisture or oxygen into the light emitting device **120** that is vulnerable thereto. For this purpose, the encapsulation part **140** includes a plurality of inorganic encapsulation layers **142** and **146**, and an organic encapsulation layer **144** interposed between the inorganic encapsulation layers **142** and **146**, wherein the inorganic encapsulation layer **146** is disposed as an uppermost layer. In this case, the encapsulation part **140** includes at least two inorganic encapsulation layers **142** and **146**, and at least one organic encapsulation layer **144**. An example of the encapsulation part **140** having a structure in which the organic encapsulation layer **144** is disposed between the first and second inorganic encapsulation layers **142** and **146** will be described.

The first inorganic encapsulation layer **142** is formed on the substrate **111** provided with the cathode **126** such that it is the closest to the light emitting device **120**. The first inorganic encapsulation layer **142** is formed using an inorganic insulating material that can be deposited at a low temperature, such as silicon nitride (SiN_x), silicon oxide (SiO_x), silicon oxycarbide (SiON) or aluminum oxide (Al_2O_3). Accordingly, since the first inorganic encapsulation layer **142** is deposited at a low temperature, it is possible to prevent damage to the organic light emitting layer of the light emitting stack **124** vulnerable to high temperatures upon deposition of the first inorganic encapsulation layer **142**.

The organic encapsulation layer **144** functions as a buffer that reduces stress between the respective layers resulting from bending of the organic light emitting display and improves planarization performance. The organic encapsulation layer **144** is formed using an organic insulating material such as an acrylic resin, an epoxy resin, polyimide, polyethylene or silicon oxycarbide (SiOC).

The second inorganic encapsulation layer **146** is formed on the substrate **111** provided with the organic encapsulation layer **144** such that it covers the upper surfaces of the organic encapsulation layer **144**. Accordingly, the second inorganic encapsulation layer **146** minimizes or prevents permeation of exterior moisture or oxygen into the organic encapsulation layer **144**. The second inorganic encapsulation layer **146** is formed using an inorganic insulating material such as silicon nitride (SiN_x), silicon oxide (SiO_x), silicon oxynitride (SiON) or aluminum oxide (Al_2O_3).

As shown in FIGS. **2** and **3**, a touch sensing line **154** and a touch driving line **152** are disposed on the encapsulation part **140** such that the touch sensing line **154** and the touch driving line **152** intersect each other via a touch insulating layer **158**.

The touch driving line **152** includes a plurality of first touch electrodes **152***e*, and first bridges **152***b* for electrically connecting the first touch electrodes **152***e* to one another.

The first touch electrodes **152***e* are spaced from one another by a predetermined distance along an X or Y direction on the encapsulation part **140**. Each of the first touch electrodes **152**e is electrically connected to an adjacent first touch electrode **152**e through the first bridge **152**b.

The first bridge **152**b is disposed on the encapsulation part **140** that is disposed on the same plane as the first touch electrode **152**e and is electrically connected to the first touch electrode **152**e without an additional contact hole. Because the first bridge **152**b overlaps the bank **128**, it is possible to prevent deterioration in the opening ratio by the first bridge **152**b.

The touch sensing line **154** includes a plurality of second touch electrodes **154**e and second bridges **154**b for electrically connecting the second touch electrodes **154** to one another.

The second touch electrodes **154**e are spaced from one another by a predetermined distance along a Y or X direction on the encapsulation part **140**. Each of the second touch electrodes **154**e is electrically connected to an adjacent second touch electrode **154**e through a second bridge **154**b.

The second bridge **154**b is formed on the touch insulation layer **158** and is electrically connected to the second touch electrode **154**e exposed by a touch sensor contact hole **150** passing through the touch insulation layer **158**. Similar to the first bridge **152**b, the second bridge **154**b overlaps the bank **128**, thus preventing deterioration in opening ratio by the second bridge **154**b.

As such, the touch sensing lines **154** intersect one another via the touch driving line **152** and the touch insulation layer **158** to form mutual capacitance (Cm) at the intersection between the touch sensing line **154** and the touch driving line **152**. Accordingly, mutual capacitance (Cm) functions as a touch sensor by charging an electric charge by a touch driving pulse supplied to the touch driving line **152** and discharging the charged electric charge to the touch sensing line **154**.

Meanwhile, each of the first and second touch electrodes **152**e and **154**e according to the present disclosure may be formed in the form of a plate as shown in FIG. **2** or in the form of a mesh as shown in FIG. **4**. That is, the first and second touch electrodes **152**e and **154**e shown in FIG. **4** include a transparent conductive layer **15**b, and a mesh metal layer **15**a formed in the form of a mesh on or under the transparent conductive layer **15**b. The mesh metal layer **15**a is formed by the same mask process as the routing line **156** using the same material as the routing line **156**. Accordingly, it is possible to prevent complication of the manufacturing process and an increase in manufacturing costs resulting from the mesh metal layer **15**a.

Furthermore, the touch electrodes **152**e and **154**e may be composed of only the mesh metal layer **15**a without the transparent conductive layer **15**b, or may be formed of the transparent conductive layer **15**b in the form of a mesh without the mesh metal layer **15**a. Here, because the touch electrodes **152**e and **154**e including the mesh metal layer **15**a such as Al, Ti, Cu or Mo have better conductivity than touch electrodes **152**e and **154**e including the transparent conductive layer **15**b such as ITO or IZO, the touch electrodes **152**e and **154**e can be formed as low-resistance electrodes. Accordingly, touch sensitivity can be improved due to decreased resistance and capacitance of the touch electrodes **152**e and **154**e, and thus reduced RC time constant. In addition, it is possible to prevent deterioration in the opening ratio and transmittance due to very small line width of the mesh metal layer **1542**. In addition, as shown in FIG. **4**, the second bridge **154**b, which is disposed in a different plane from the touch electrodes **152**e and **154**e and includes a non-transparent conductive layer, includes a plurality of slits **151**. Accordingly, the second bridge **154**b including the slits **151** can reduce an area as compared to a bridge including no slit **151**. Accordingly, it is possible to reduce reflection of exterior light by the second bridge **154**b and thus prevent deterioration of visibility. The second bridge **154**b including the slits **151** overlaps the bank **128**, thereby preventing deterioration of opening ratio by the second bridge **154**b including a non-transparent conductive layer.

The touch driving line **152** and the touch sensing line **154** according to the present disclosure are connected to a touch driving part (not shown) through a routing line **156** and a touch pad **170** disposed in a non-active (bezel) region.

Accordingly, the routing line **156** transmits a touch driving pulse generated in the touch driving part through the touch pad **170** to the touch driving line **152**, and transmits a touch signal from the touch sensing line **154** to the touch pad **170**. The routing line **156** is disposed between each of the first and second touch electrodes **152**e and **154**e, and the touch pad **170**, and is electrically connected to each of the first and second touch electrodes **152**e and **154**e, without an additional contact hole.

As shown in FIG. **2**, the routing line **156** connected to the first touch electrode **152**e extends along at least one of upper and lower sides of an active region and is connected to the touch pad **170**. The routing line **156** connected to the second touch electrode **154**e extends along at least one of left and right sides of the active region and is connected to the touch pad **170**. Meanwhile, the disposition of the routing line **156** is not limited to the structure shown in FIG. **2** and is variably changed depending on the design specifications of the display.

The routing line **156** is formed as a monolayer or multilayer structure using a first conductive layer with excellent corrosion resistance, acid resistance and conductivity, such as Al, Ti, Cu or Mo. For example, the routing line **156** is formed as a three-layer stack structure such as Ti/Al/Ti or Mo/Al/Mo, or is formed as a multilayer structure including a transparent conductive layer with excellent corrosion resistance and acid resistance, such as ITO or IZO, and a non-transparent conductive layer with excellent conductivity, such as Ti/Al/Ti or Mo/Al/Mo.

The touch pad **170** includes a touch auxiliary electrode **168**, first touch pad electrodes **172** and second touch pad electrodes **174**, and a touch cover electrode **176**.

The touch auxiliary electrode **168** is formed on the same plane as source and drain electrodes **136** and **138** using the same material as the source and drain electrodes **136** and **138** of the driving transistor (T**2**) **130**. That is, the touch auxiliary electrode **168** is formed on the interlayer insulating layer **114** using the same material as the source and drain electrodes **136** and **138**.

The first touch pad electrode **172** extends from the routing line **156** and is formed using the same material as the routing line **156**. The first touch pad electrode **172** is electrically connected to the touch auxiliary electrode **168** exposed through the first touch pad contact hole **178**a passing through the protective layer **116**.

The second touch pad cover electrode **174** is formed using the same material as the first and second touch electrodes **152**e and **154**e. The second touch pad electrode **174** is formed to cover the first touch pad electrode **172**, so that it can be directly connected to the first touch pad electrode **172** without an additional contact hole.

As shown in FIG. **3**, in one embodiment the touch pad electrodes **172**, **174** are directly connected to the touch auxiliary electrode **168** and the touch cover electrode **176**. In another embodiment, the touch pad electrodes **172**, **174** are not directly connected to the touch auxiliary electrode **168** and the touch cover electrode **176**. Rather, the touch pad electrodes are horizontally shifted (e.g., to the left) and are not directly connected to the touch auxiliary electrode **168**. In this alternative embodiment, a first contact hole exposes a portion of the touch auxiliary electrode **168** and a second contact hole exposes a portion of the touch pad electrodes **172**, **174** that are horizontally shifted away from the touch auxiliary electrode **168**. The touch cover electrode **176** is electrically connected to the touch auxiliary electrode **168** via the touch pad electrodes **172**,**174** in the alternative embodiment.

The touch cover electrode **176** is disposed on the same plane as the conductive layer included in the touch sensor using the same manner material as the conductive layer. For example, the display cover electrode **188** is formed on the touch insulating layer **158**, which is disposed on the same plane as the second bridge **154***b*, using the same material as the second bridge **154***b*, which is disposed as the uppermost layer of the touch tensor. The touch cover electrode **176** is electrically connected to the second touch pad electrode **174** exposed by the second pad contact hole **178***b* passing through the touch insulating layer **158**. The touch cover electrode **176** is formed to be exposed by the touch barrier layer **194**, so that it can be connected to a signal transmission layer provided with the touch driving part. Here, the touch barrier layer **194** is formed to cover the touch sensing line **154** and the touch driving line **152**, thereby preventing damage to the light emitting device **120** as well as the touch sensing line **154** and the touch driving line **152** by exterior moisture or the like. The touch barrier layer **194** is formed by coating an organic insulating layer with an inorganic insulating layer. An optical layer (not shown) such as a circular polarizer or brightness improvement film (OLED transmittance controllable film; OTF) may be disposed on the touch barrier layer **194**.

Meanwhile, the touch pad **170** and the display pad **180** are disposed in a non-active (bezel) region. As shown in FIG. **2**, the touch pad **170** and the display pad **180** may be disposed in at least one of one and second sides of the substrate **111**, or the touch pad **170** and the display pad **180** may be disposed in different regions. Meanwhile, the disposition of the touch pad **170** and the display pad **180** is not limited to the structure shown in FIG. **2** and can be variably changed depending on design specifications of the display. As such, the display pad **180** disposed with the touch pad **170** in the non-active region has the same stack structure as the touch pad **170**. In this case, since the touch cover electrode **176** and the display cover electrode **188** respectively disposed as the uppermost layers of the touch pad **170** and the display pad **180** are disposed on the same plane as each other, processes of adhering signal transmission layers can be simultaneously performed and the overall process can thus be simplified. The display pad **180** includes a display pad electrode **182**, at least one layer of display auxiliary electrodes **184** and **186** and a display cover electrode **188**.

The display pad electrode **182** extends from at least one signal line of a scan line (SL), a data line (DL) and a high-voltage power (VDD) line in an active region in which the light emitting device **120** is formed. The display pad electrode **182** is formed as a monolayer or a multilayer structure on the same plane as at least one of the gate electrode **132** of the driving transistor (T**2**) **130**, and source and drain electrodes **136** and **138**, using the same material as at least one of the gate electrode **132** of the driving transistor (T**2**) **130**, and the source and drain electrodes **136** and **138**. That is, the display pad electrode **182** having a monolayer structure is formed on the interlayer insulating layer **114** using the same material as the source and drain electrodes **136** and **138**, or is formed on the substrate **111** using the same material as the gate electrode **132**. The display pad electrode **182** having a multilayer structure includes a first display pad electrode (not shown) formed on the substrate **111** using the same material as the gate electrode **132**, and a second display pad electrode (not shown) which is connected to the first display pad electrode and is formed on the interlayer insulating layer **114** using the same material as source and drain electrodes **136** and **138**.

The first display auxiliary electrode **184** is formed on the same plane as the routing line **156** using the same material as the routing line **156**. The first display auxiliary electrode **184** is electrically connected to the display pad electrode **182** exposed by the display pad contact hole **190** passing through the protective layer **116**.

The second display auxiliary electrode **186** is formed using the same material as the first and second touch electrodes **152***e* and **154***e*. The second display auxiliary electrode **186** covers the first display auxiliary electrode **184** and is thus directly connected to the first display auxiliary electrode **184** without an additional contact hole.

As shown in FIG. **3**, in one embodiment the display auxiliary electrode is directly connected to the display pad electrode **182** and the display cover electrode **188**. In another embodiment, the display auxiliary electrode is not directly connected to the display pad electrode **182**. Rather, the display auxiliary electrode is horizontally shifted (e.g., to the right) and is not overlapped by the display pad electrode **182** and the display cover electrode **188**. In this alternative embodiment, a first contact hole exposes a portion of the display pad electrode **182** and a second contact hole exposes a portion of the display auxiliary electrode that is horizontally shifted away from the display pad electrode **182**. The display cover electrode **188** is electrically connected to the display pad electrode **182** via the display auxiliary electrode in the alternative embodiment.

The display cover electrode **188** is formed on the touch insulating layer **158** that is on the same plane as the second bridge **154***b* using the same material as the second bridge **154***b*. The display cover electrode **188** is electrically connected to the second display auxiliary electrode **186** exposed by the second display pad contact hole **192** passing through the touch insulating layer **158**.

FIGS. **5**A to **5**E are a plan view and sectional views illustrating a method of manufacturing the organic light emitting display with a touch sensor shown in FIG. **3**.

Referring to FIG. **5**A, a substrate **111** provided with a switching transistor, a driving transistor (T**2**) **130**, a light emitting device **120** and a encapsulation part **140** is provided.

Specifically, a touch auxiliary electrode **168**, a display pad electrode **182**, the switching transistor and the driving transistor (T**2**) **130** are formed on the substrate **111** by a plurality of mask processes. Here, the touch auxiliary electrode **168** and the display pad electrode **182** are simultaneously formed with the source and drain electrodes **136** and **138** of the driving transistor (T**2**) **130** using the same mask process. Thus, the touch auxiliary electrode **168** and the display pad electrode **182** are made of a same material as the source and drain electrodes **136** and **138** of the driving transistor (T**2**) **130**. Furthermore, the display pad electrode **182** may be simultaneously formed with the gate electrode (**132**) of the driving transistor (T**2**) **130** using the same mask process.

Then, a protective layer **116** and a planarization layer **118** are formed over the entire surface of the resulting structure to cover the touch auxiliary electrode **168**, the display pad electrode **182**, the switching transistor and the driving transistor (T**2**) **130**, and are then patterned by photolithography and etching to form a pixel contact hole **148**, a first touch pad contact hole **178***a* and a first display pad contact hole **190** passing through the protective layer **116** and the planarization layer **118**. Then, an anode **122**, a bank **128**, a light emitting stack **124** and a cathode **126** are sequentially formed on the planarization layer **118**. Inorganic encapsulation layers **142** and **146** and an organic encapsulation layer **144** are sequentially stacked on the substrate **111** provided with the cathode **126**, thereby forming a encapsulation part **140**.

Referring to FIG. **5**B, a routing line **156**, a first touch pad electrode **172** and a first display auxiliary electrode **184** are formed on the substrate **111** provided with the encapsulation part **140**.

Specifically, the first conductive layer is deposited at room temperature by deposition using sputtering over the entire surface of the substrate **111** provided with the encapsulation part **140** and is then patterned by photolithography and etching to form a routing line **156**, a first touch pad electrode **172** and a first display auxiliary electrode **184**. Here, the first conductive layer is formed as a monolayer or multilayer structure using a metal with excellent corrosion resistance and acid resistance such as Al, Ti, Cu or Mo. For example, the first conductive layer is formed as a three-layer stack structure such as Ti/Al/Ti or Mo/Al/Mo. The first display auxiliary electrode **184** prevents exposure of the display pad electrode **182**, thus preventing damage to the display pad electrode **182** upon formation of the routing line **156**, the first and second touch electrodes **152***e* and **154***e* and the first and second bridges **152***b* and **154***b*.

Referring to FIG. **5**C, first and second touch electrodes **152***e* and **154***e*, a first bridge **152***b*, a second touch pad electrode **174** and a second display auxiliary electrode **186** are formed on the substrate **111** provided with the routing line **156**, the first touch pad electrode **172** and the first display auxiliary electrode **184**.

Specifically, the second conductive layer is deposited over the entire surface of the substrate **111** provided with the routing line **156** and the first touch pad electrode **172**. Here, in a case in which a transparent conductive layer such as ITO or IZO is used as the second conductive layer, the transparent conductive layer is formed at room temperature by deposition such as sputtering. Then, the second conductive layer is patterned by photolithography and etching to form the first and second touch electrodes **152***e* and **154***e*, the first bridge **152***b*, the second touch pad electrode **174** and the second display auxiliary electrode **186**.

Referring to FIG. **5**D, a touch insulation layer **158** having a touch sensor contact hole **150**, a second touch pad contact hole **178***b* and a second display pad contact hole **192** is formed on the substrate **111** provided with the first and second touch electrodes **152***e* and **154***e*, the first bridge **152***b*, the second touch pad electrode **174** and the second display auxiliary electrode **186**.

Specifically, a touch insulation layer **158** is formed to a thickness of 500 Å to 5 μm on the substrate **111** provided with the first and second touch electrodes **152***e* and **154***e*, the first bridge **152***b* and the second touch pad electrode **174**. Here, in a case in which an organic layer is used as the touch insulation layer **158**, the organic layer is coated on the substrate and is then cured at a temperature of 100 degrees or less in order to prevent damage to the light emitting stack **124** vulnerable to high temperatures, to form the touch insulation layer **158**. In a case in which an inorganic layer is used as the touch insulation layer **158**, low-temperature CVD deposition and washing processes were repeated at least twice in order to prevent damage to the light emitting stack **124** vulnerable to high temperatures to form a touch insulation layer **158** with a multilayer structure. Then, the touch insulation layer **158** is patterned by photolithography and etching to form a touch insulating layer **158** including a touch sensor contact hole **150**, a second touch pad contact hole **178***b* and a second display pad contact hole **192**.

Referring to FIG. **5**E, a second bridge **154***b*, a touch cover electrode **176** and a display cover electrode **188** are formed on the substrate **111** provided with the touch insulation layer **158** having a touch sensor contact hole **150**, a touch pad contact hole **178** and a display pad contact hole **190**.

Specifically, a third conductive layer is formed on the substrate **111** provided with the touch insulation layer **158** having the touch sensor contact hole **150**, the second touch pad contact hole **178***b* and the second display pad contact hole **192**. Here, in a case in which a transparent conductive layer such as ITO or IZO, or a metal with excellent corrosion resistance and acid resistance such as Al, Ti, Cu or Mo is used as the third conductive layer, the third conductive layer is formed at room temperature by deposition such as sputtering. Then, the third conductive layer is patterned by photolithography and etching to form a second bridge **154***b*, a touch cover electrode **176** and a display cover electrode **188**. Then, a touch barrier layer **194** and an optical film are attached to the substrate **111** provided with the second bridge **154***b*, the pad cover electrode **176** and the display cover electrode **188**, as shown in FIG. **3**.

The organic light emitting display with a touch sensor according to the first embodiment of the present invention has a structure in which the touch electrodes **152***e* and **154***e* are directly disposed on the encapsulation part **140**. Accordingly, as compared to a conventional organic light emitting display in which a touchscreen is directly attached to the organic light emitting display by an adhesive agent, the present disclosure does not require an adhesion process, thus simplifying a manufacturing process and reducing manufacture costs.

In addition, the organic light emitting display with a touch sensor according to the first embodiment of the present disclosure has a structure in which the first display auxiliary electrode **184** formed using the same mask process as the routing line **156**, the second display auxiliary electrode **186** formed using the same mask process as the first and second touch electrodes **152***e* and **154***e*, and the display cover electrode **188** formed using the same mask process as the second bridge **154***b* are each disposed on the display pad electrode **182**. In this case, it is possible to prevent exposure of the display pad electrode **182** during manufacture of each of the routing line **156**, the first and second touch electrodes **152***e* and **154***e*, and the second bridge **154***b*. Accordingly, it is possible to prevent damage to the display pad electrode **182** by an etching gas or liquid used for manufacturing the routing line **156**, the first and second touch electrodes **152***e* and **154***e* and the second bridge **154***b*.

FIG. **6** is a sectional view illustrating an organic light emitting display with a touch sensor according to a second embodiment of the present disclosure.

The organic light emitting display illustrated in FIGS. **6** and **7** includes the same elements as the organic light emitting display according to the first embodiment of the present invention, except that the stack structures of the touch pad **170** and the display pad **180** are different. Accordingly, detailed description of the same elements will be omitted.

The display pad **180** includes a display pad electrode **182** and a display cover electrode **188**.

The display pad electrode **182** extends from at least one signal line of a scan line (SL), a data line (DL) and a high-voltage power (VDD) line in an active region in which the light emitting device **120** is formed. The display pad electrode **182** is formed as a monolayer or a multilayer structure on the same plane as at least one of the gate electrode **132** of the driving transistor (T**2**) **130**, and source and drain electrodes **136** and **138**, using the same material as at least one of the gate electrode **132** of the driving transistor (T**2**) **130**, and the source and drain electrodes **136** and **138**. That is, the display pad electrode **182** having a monolayer structure is formed on the interlayer insulating layer **114** using the same material as the source and drain electrodes **136** and **138**, or is formed on the substrate **111** using the same material as the gate electrode **132**. The display pad electrode **182** having a multilayer structure includes a first display pad electrode (not shown) formed on the substrate **111** using the same material as the gate electrode **132**, and a second display pad electrode (not shown) which is connected to the first display pad electrode on the interlayer insulating layer **114** and is formed using the same material as source and drain electrodes **136** and **138**.

The display cover electrode **188** is disposed on the same plane as the conductive layer included in the touch sensor using the same material as the conductive layer. For example, the display cover electrode **188** is formed on the touch insulating layer **158** that is formed on the same plane as the second bridge **154***b* using the same material as the second bridge **154***b* disposed as the uppermost layer of the touch sensor. The display cover electrode **188** is electrically connected to the display pad electrode **182** exposed by the display pad contact hole **190** passing through the protective layer **116** and the touch insulating layer **158**. Meanwhile, although, in the present disclosure, a structure in which the protective layer **116** and the touch insulating layer **158** are disposed on the display pad electrode has been illustrated, at least one of a lower insulating layer disposed under the light emitting device and an upper insulating layer disposed on the light emitting device is disposed on the display pad electrode **182**. Here, the lower insulating layer is any one of the protective layer **116** and the planarization layer **118**, and the upper insulating layer is any one of the first and second inorganic encapsulation layers **142** and **146**, the organic encapsulation layer **144** and the touch insulating layer **158**. In this case, the display pad contact hole **190** passes through at least one of the upper insulating layer and the lower insulating layer disposed on the display pad electrode **182**.

The touch pad **170** includes at least one layer of touch pad electrodes **172** and **174** and a touch cover electrode **176**.

The first touch pad electrode **172** extends from the routing line **156** and is formed using the same material as the routing line **156**.

The second touch pad electrode **174** is formed using the same material as the first and second touch electrodes **152***e* and **154***e*. The second touch pad electrode **174** covers the first touch pad electrode **172** and is directly connected to the first touch pad electrode **172** without an additional contact hole.

The touch cover electrode **176** is formed on the touch insulating layer **158** that is disposed on the same plane as the second bridge **154***b* using the same material as the second bridge **154***b*. The touch cover electrode **176** is electrically connected to the second touch pad electrode **174** exposed by the touch pad contact hole **178** passing through the touch insulating layer **158**.

The touch cover electrode **176** is exposed by the touch barrier layer **194** and is thus connected to a signal transmission layer provided with the touch driving part, and the display cover electrode **188** is exposed by the touch barrier layer **194** and is thus connected to a signal transmission layer provided with the display driving part (for example, gate driving part and data driving part). Here, the touch barrier layer **194** covers the touch sensing line **154** and the touch driving line **152**, thereby preventing damage to the light emitting device **120** as well as the touch sensing line **154** and the touch driving line **152** by exterior moisture. The touch barrier layer **194** is formed by coating an organic insulating layer with an inorganic insulating layer.

An optical film (not shown) such as a circular polarizer or a brightness improvement film (OLED transmittance controllable film; OTF) may be disposed on the touch barrier layer **194**.

FIGS. **7**A to **7**E are a plan view and sectional views illustrating a method of manufacturing the organic light emitting display with a touch sensor shown in FIG. **6**.

Referring to FIG. **7**A, a substrate **111** provided with a switching transistor, a driving transistor (T**2**) **130**, a light emitting device **120** and a encapsulation part **140** is provided.

Specifically, a display pad electrode **182**, a switching transistor, a driving transistor (T**2**) **130** and a light emitting device **120** are formed on the substrate **111** by a plurality of mask processes. At this time, the display pad electrode **182** is simultaneously formed with the source and drain electrodes **136** and **138** of the driving transistor (T**2**) **130** using the same mask process as the source and drain electrodes **136** and **138**. Furthermore, the display pad electrode **182** may be simultaneously formed with the gate electrode **132** of the driving transistor (T**2**) **130** using the same mask process as the gate electrode **132**. Then, inorganic encapsulation layers **142** and **146** and an organic encapsulation layer **144** are sequentially stacked on the substrate **111** provided with the light emitting device **120**, thereby forming the encapsulation part **140**.

Referring to FIG. **7**B, a routing line **156** and a first touch pad electrode **172** are formed on the substrate **111** provided with the encapsulation part **140**.

Specifically, the first conductive layer is deposited at room temperature by deposition using sputtering over the entire surface of the substrate **111** provided with the encapsulation part **140**, and is then patterned by photolithography and etching to form a routing line **156** and a first touch pad electrode **172**. Here, the first conductive layer is formed as a monolayer or multilayer structure using a metal with excellent corrosion resistance and acid resistance, such as Al, Ti, Cu or Mo. For example, the first conductive layer is formed as a three-layer stack structure such as Ti/Al/Ti or Mo/Al/Mo.

Referring to FIG. **7**C, first and second touch electrodes **152***e* and **154***e*, a first bridge **152***b* and a second touch pad electrode **174** are formed on the substrate **111** provided with the routing line **156** and the first touch pad electrode **172**.

Specifically, the second conductive layer is deposited over the entire surface of the substrate **111** provided with the routing line **156** and the first touch pad electrode **172**. Here, in a case in which a transparent conductive layer such as ITO or IZO is used as the second conductive layer, the transparent conductive layer is formed at room temperature by deposition such as sputtering. Then, the second conductive layer is patterned by photolithography and etching to form first and second touch electrodes **152***e* and **154***e*, a first bridge **152***b* and a second touch pad electrode **174**.

Referring to FIG. 7D, a touch insulating layer **158** including a touch sensor contact hole **150**, a touch pad contact hole **178** and a display pad contact hole **190** is formed on the substrate **111** provided with the first and second touch electrodes **152***e* and **154***e*, the first bridge **152***b* and the second touch pad electrode **174**.

Specifically, a touch insulation layer **158** is formed to a thickness of 500 Å to 5 μm by deposition or coating on the substrate **111** provided with the first and second touch electrodes **152***e* and **154***e*, the first bridge **152***b* and the second touch pad electrode **174**. Here, in a case in which an organic layer is used as the touch insulation layer **158**, the organic layer is coated on the substrate and is then cured at a temperature of 100 degrees or less, thereby forming the touch insulating layer **158**. In a case in which an inorganic layer is used as the touch insulation layer **158**, low-temperature CVD deposition and washing processes were repeated at least twice, to form a touch insulation layer **158** with a multilayer structure. Then, the touch insulating layer **158** and the protective layer **116** are patterned by photolithography and etching to form a touch sensor contact hole **150**, a touch pad contact hole **178** and a display pad contact hole **190**. The touch sensor contact hole **150** passes through the touch insulating layer **158** to expose the second touch electrode **154***e*. The touch pad contact hole **178** passes through the touch insulating layer **158** to expose the second touch pad electrode **174**. The display pad contact hole **190** passes through the protective layer **116** and the touch insulating layer **158** to expose the display pad electrode **182**.

Meanwhile, during formation of the touch sensor contact hole **150**, the touch pad contact hole **178** and the display pad contact hole **190**, the mesh-type metal layer **15***a* of the touch electrodes **152***e* and **154***e* is protected by a transparent conductive layer **15***b* of the touch electrodes **152***e* and **154***e*, as shown in FIG. **4**, to prevent an etching gas from damaging the mesh-type metal layer **15***a*.

Referring to FIG. 7E, a second bridge **154***b*, a touch cover electrode **176** and a display cover electrode **188** are formed on the substrate **111** provided with the touch insulating layer **158** including the touch sensor contact hole **150**, the touch pad contact hole **178** and the display pad contact hole **190**.

Specifically, a third conductive layer is formed on the substrate **111** provided with the touch insulating layer **158** including the touch sensor contact hole **150**, the touch pad contact hole **178** and the display pad contact hole **190**. Here, in a case in which a transparent conductive layer such as ITO or IZO, or a metal with excellent corrosion resistance and acid resistance such as Al, Ti, Cu or Mo is used as the third conductive layer, the third conductive layer is formed at room temperature by deposition such as sputtering. Then, the third conductive layer is patterned by photolithography and etching to form a second bridge **154***b*, a touch cover electrode **176** and a display cover electrode **188**. Then, a touch barrier layer **194** and an optical film are attached to the substrate **111** provided with the second bridge **154***b*, the pad cover electrode **176** and the display cover electrode **188**.

As such, the organic light emitting display with a touch sensor according to the second embodiment of the present disclosure has a structure in which touch electrodes **152***e* and **154***e* are directly disposed on the encapsulation part. Accordingly, as compared to a conventional organic light emitting display in which a touchscreen is directly attached to the organic light emitting display by an adhesive agent, the present disclosure does not require an adhesion process, thus simplifying a manufacturing process and reducing manufacturing costs.

In addition, regarding the organic light emitting display with a touch sensor according to the second embodiment of the present disclosure, the display pad contact hole **190** exposing the display pad electrode **182** is simultaneously formed with the touch pad contact hole **178** exposing the touch pad electrodes **172** and **174**. Accordingly, according to the present disclosure, the display pad contact hole can be formed without an additional mask process.

In addition, according to the present disclosure, during formation of the routing line **156** and the first and second touch electrodes **152***e* and **154***e*, the display pad electrode **182** is protected by the pad insulating layer including the protective layer **116** and the touch insulating layer **158**, thus preventing the display pad electrode **182** from being exposed to the outside until the display pad contact hole **190** is formed. Accordingly, it is possible to prevent damage to the display pad electrode **182**, in particular, decrease in thickness of the display pad electrode **182**, by an etching gas or liquid used for formation of the routing line **156** and the first and second touch electrodes **152***e* and **154***e*.

Meanwhile, although an example in which the routing line **156** of the organic light emitting display according to the present disclosure is formed using a different mask process from the touch electrodes **152***e* and **154***e* and bridges **152***b* and **154***b* has been illustrated as shown in FIG. **3**, the touch electrodes **152***e* and **154***e* and the bridges **152***b* and **154***b* may be formed using the same mask process, as shown in FIGS. **8**A and **8**B. That is, as shown in FIG. **8**A, the routing line **156** includes a first routing layer **156***a* formed using the same mask process as the touch electrodes **152***e* and **154***e*, and a second routing layer **156***b* formed using the same mask process as the second bridge **154***b*. In this case, the first routing layer **156***a* is formed using the same material as the touch electrodes **152***e* and **154***e*, and the second routing layer **156***b* is formed using the same material as the second bridge **154***b*. In addition, as shown in FIG. **8**B, the routing line **156** includes a first routing layer **156***c* including a first conductive layer, a second routing layer **156***b* formed using the same mask process as the touch electrodes **152***e* and **154***e*, and a third routing layer **156***c* formed using the same mask process as the second bridge **154***b*. In this case, the second routing layer **156***b* is formed using the same material as the touch electrodes **152***e* and **154***e* and the third routing layer **156***c* is formed using the same material as the second bridge **154***b*.

In addition, as shown in FIG. **9**, the organic light emitting display according to the present disclosure includes a touch buffer layer **196** formed between each of the touch sensing line **154** and the touch driving line **152**, and the light emitting device **120**. In the touch buffer layer **196**, the distance between each of the touch sensing line **154** and the touch driving line **152**, and the cathode **126** should be maintained at 5 μm or more. Accordingly, the capacitance of a parasitic capacitor formed between each of the touch sensing line **154** and the touch driving line **152**, and the cathode **126** can be minimized and mutual effect by coupling between each of the touch sensing line **154** and the touch driving line **152**, and the cathode **126** can thus be prevented. Also, as shown in FIG. **9**, the organic light emitting display according to the present disclosure includes color filters **198** disposed between touch buffer layer **196** and the inorganic encapsulation layer **146**. The color filters **198** include at least a red color filter, a green color filter, and a blue color filter. At least one of the first bridge **152***b* and the second bridge **154***b* overlaps a boundary of each of the color filters **198**.

Meanwhile, although an example in which a light emitting stack **124** is disposed between the anode **122** and the cathode **126** of the organic light emitting display according to the present disclosure has been illustrated, two or more light emitting stacks may be disposed. For example, as shown in FIG. **9**, first and second light emitting stacks **124***a* and **124***b* are disposed between the anode **122** and the cathode **126**. A charge generation layer (CGL) is disposed between the first and second light emitting stacks **124***a* and **124***b*. The first light emitting stack **124***a* includes a hole transport layer (HTL**1**), an organic light emitting layer (EML**1**) and an electron transport layer (EML**1**) stacked in this order on an anode **122**, and the second light emitting stack **124***b* includes a hole transport layer (HTL**2**), an organic light emitting layer (EML**2**) and an electron transport layer (ELT**2**) stacked in this order on the charge generation layer (CGL). Here, any one of the organic light emitting layer (EML**1**) of the first light emitting stack **124***a* and the organic light emitting layer (EML**2**) of the second light emitting stack **124***b* generates blue light and the other of the organic light emitting layer (EML**1**) of the first light emitting stack **124** and the organic light emitting layer (EML**2**) of the second light emitting stack **124***b* generates yellow-green light, thereby generating white light through the first and second light emitting stacks **124***a* and **124***b*.

As such, according to the present disclosure, the touch sensor shown in FIGS. **1** to **9** may be applied to at least one light emitting stack **124** generating white light and the encapsulation part **140** of the organic light emitting display including color filters.

As apparent from the fore-going, the organic light emitting display with a touch sensor according to the present disclosure has a structure in which touch electrodes are directly disposed on the encapsulation part without an adhesive agent. Accordingly, the present disclosure does not require an additional adhesion process, thus simplifying a manufacturing process and reducing manufacture costs. In addition, the organic light emitting display with a touch sensor according to the present disclosure has a structure in which a display cover electrode of a display pad is disposed on the same plane as the conductive layer included in the touch sensor using the same material as the conductive layer, thereby preventing damage to the display pad electrode.

It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the spirit or scope of the inventions. Thus, it is intended that the present invention covers the modifications and variations of this invention provided they come within the scope of the appended claims and their equivalents.

What is claimed is:

1. A display device comprising:

a light-emitting device disposed on a substrate;

an encapsulation unit disposed on the light-emitting device;

a plurality of touch electrodes disposed on the encapsulation unit, the plurality of touch electrodes comprising a plurality of first touch electrodes arranged in a first direction and a plurality of second touch electrodes arranged in a second direction that intersects the first direction;

color filters on the encapsulation unit;

a plurality of bridges disposed on the encapsulation unit, the plurality of bridges comprising first bridges that interconnect the plurality of first touch electrodes and second bridges that interconnect the plurality of second touch electrodes; and

a routing line including a first routing line electrically connected to the plurality of first touch electrodes and a second routing line electrically connected to the plurality of second touch electrodes,

wherein at least one of the first bridge and the second bridge overlaps a boundary of each of the color filters.

2. The display device according to claim **1**, further comprising:

a touch dielectric film disposed between the first bridges and the second bridges, wherein the plurality of first touch electrodes, the plurality of second touch electrodes, and the first bridges are disposed on the encapsulation unit,

wherein the second bridges are disposed on the touch dielectric film, and the second bridges are connected to the plurality of second touch electrodes, which are exposed through touch contact holes in the touch dielectric film.

3. The display device according to claim **2**, further comprising:

an auxiliary bridge disposed between the first bridges and the encapsulation unit, the auxiliary bridge connected to the first bridges.

4. The display device according to claim **2**, wherein the second bridges are disposed on the encapsulation unit,

wherein the plurality of first touch electrodes, the plurality of second touch electrodes, and the first bridges are disposed on the touch dielectric film, and

wherein the plurality of second touch electrodes are connected to the second bridges, which are exposed through touch contact holes in the touch dielectric film.

5. The display device according to claim **4**, wherein the second bridges are disposed between the plurality of first touch electrodes, the plurality of second touch electrodes, and the encapsulation unit.

6. The display device according to claim **1**, wherein at least one of the first bridges, the second bridges, the plurality of first touch electrodes, or the plurality of second touch electrodes includes a structure in which a plurality of conductive films is stacked.

7. The display device according to claim **6**, wherein at least one of the plurality of conductive films includes a multi-layered structure.

8. The display device according to claim **6**, wherein at least one of the plurality of conductive films includes a multi-layered structure comprising one of aluminum, titanium, copper, molybdenum, indium tin oxide, or indium zinc oxide.

9. The display device according to claim **6**, wherein at least one of the plurality of conductive films comprises one of titanium/aluminum/titanium or molybdenum/aluminum/molybdenum.

10. The display device according to claim **1**, wherein at least one of the plurality of first touch electrodes, the plurality of second touch electrodes, the first bridges, or the second bridges comprises a mesh-shaped conductive film having an opening.

11. The display device according to claim **10**, wherein the mesh-shaped conductive film overlaps a bank that defines a light-emitting region of the light-emitting device.

12. The display device according to claim **11**, wherein the opening overlaps the light-emitting region.

13. The display device according to claim **11**, wherein the mesh-shaped conductive film is disposed along the bank.

14. The display device according to claim **1**, wherein the routing line is formed along a side surface of the encapsulation unit.

15. The display device according to claim 1, further comprising:

a touch buffer film disposed between the encapsulation unit and the plurality of touch electrodes.

16. The display device according to claim 1, wherein a width of a lower routing layer is larger than a width of an upper routing layer.

17. The display device according to claim 1, wherein a lower routing layer and an upper routing layer have different thicknesses, and a thickness of the upper routing layer is larger than a thickness of the lower routing layer.

18. The display device according to claim 1, wherein

a lower routing layer is disposed on a same layer and includes a same material as one of the first bridges and the second bridges, and

an upper routing layer is disposed on a same layer and includes a same material as another one of the first bridges and the second bridges.

19. The display device according to claim 1, further comprising:

a thin film transistor connected to the light-emitting device, wherein the thin film transistor comprises:

a gate electrode disposed on the substrate;

an active layer disposed on or under the gate electrode;

a source electrode connected to the active layer; and

a drain electrode connected to the active layer.

20. The display device according to claim 1, wherein the encapsulation unit comprises a first inorganic encapsulation layer and a second inorganic encapsulation layer that face each other in a state in which an organic encapsulation layer is disposed between the first inorganic encapsulation layer and the second inorganic encapsulation layer,

wherein the second inorganic encapsulation layer is disposed so as to cover an upper surface and a side surface of the organic encapsulation layer, and

the organic encapsulation layer is disposed so as to cover an upper surface and a side surface of the first inorganic encapsulation layer.

21. The display device according to claim 1, wherein the routing line includes a plurality of routing layers comprising a lower routing layer and an upper routing layer are stacked, and wherein the upper routing layer and the lower routing layer overlap each other on at least a portion of the encapsulation unit.

22. The display device according to claim 21, wherein the lower routing layer and the upper routing layer have different widths.

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